All tutorial files can also be downloaded from: **www.3dartistonline.com/files**

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3DArtist

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Practical inspiration for th

MAYA SCI-FI

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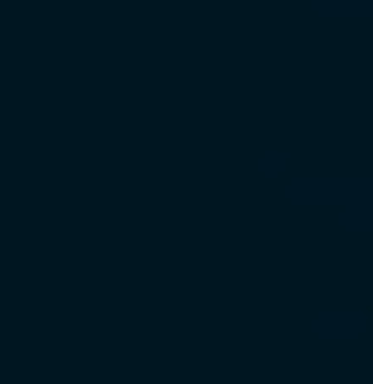
“The preliminary drawings don’t have to be totally complete, as an idea is something that needs to be constantly revised”

Sengjoon Song guides us through the creation of his *Artemis* model **Page 48**



Sengjoon Song

Personal portfolio site
www.sengjoon.com

Country USA

Software Maya 2013, MARI, Photoshop, ZBrush, NDO, UVLayout, V-Ray

Who wouldn’t want to learn to create a sleek female cyborg from the future? In this issue, senior cinematic environment artist at Blizzard, Sengjoon Song, teaches us how, with the processes and techniques behind this beautiful cover image over on p48.

Master robot design: Vitaly Bulgarov. Page 32

Welcome

to the magazine and 116 pages of amazing 3D

Welcome to 3D Artist magazine! This issue, we were lucky enough to meet the very talented Vitaly Bulgarov, who revealed how he perfected his hard-surface modelling pipeline in ZBrush and Softimage to create mechs in minutes. Discover how he's gone from Blizzard and ILM to developing the next generation of surgical robotics on p32, or take a look at Sengjoon Song's step-by-step tutorial, re-creating his cover image to push your own sci-fi skills in Maya on p48. Enjoy!

Dan Hutchinson Editor in Chief

Every issue you can count on...

1. **Exclusively commissioned art**
2. Behind-the-scenes guides to images and fantastic artwork
3. **A CD packed full of creative goodness**
4. Interviews with inspirational artists
5. **Tips for studying 3D or getting work in the industry**
6. The chance to see your art in the mag!

This issue's team of expert artists...

Sengjoon Song

Blizzard's Sengjoon reveals the steps behind re-creating this month's incredible cover image on p48

Vitaly Bulgarov

The master of sci-fi design tells us more about how he managed to get to where he is today over on p32

Gustavo Åhlén

In his third tutorial in a series of four, Gustavo sculpts the muscular anatomy of a human arm in ZBrush

Thomas Lishman

Thomas discusses his techniques for sculpting your own works for 3D printing over on p56

Rainer Duda

Rainer looks at how to use the Pyro FX 2 plug-in to create explosion effects in Houdini on p76

William Vaughan

Academic director at DAVE School William Vaughan explains how to quickly create sci-fi detail with MeshFusion

Dave Scotland

After over 13 years of CG production experience, Dave introduces us to Bifröst in Maya 2015 on p88

James Cutler

Over on p90 MintViz creative director James Cutler shows us how to blow bubbles using V-Ray Metaballs

Chris DiPaola

Want to learn how to block out 3D environments quickly? Chris reveals his simple process on p92

Orestis Bastounis

Our resident tech expert Orestis introduces us to what the new K6000 Scan workstation can do

Aldo Vicente

The Maya guru takes a look at whether the Pulldownit plug-in levels the destruction-simulation field

Poz Watson

Poz talks to MPC, DreamWorks and more to learn their top advice for landing your dream job on p24

Sign up, share your art and chat to other artists at www.3dartistonline.com

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Image - Chris Jones

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With over two million eyeballs on his YouTube "Eye Piece" animation (and Best of YouTube Channel selection to his credit), Chris Jones is shaking up the world of 3D CG with ultra-realistic human anatomy images that are straight up incredible. At the heart of this talented artist's pipeline is LightWave 3D.

"As a creative generalist I need to cover a lot of ground when working on 3D projects. LightWave enables me to do this without having to invest in a hodgepodge of expensive tools." – Chris Jones

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INSIDE ISSUE SEVENTY-TWO

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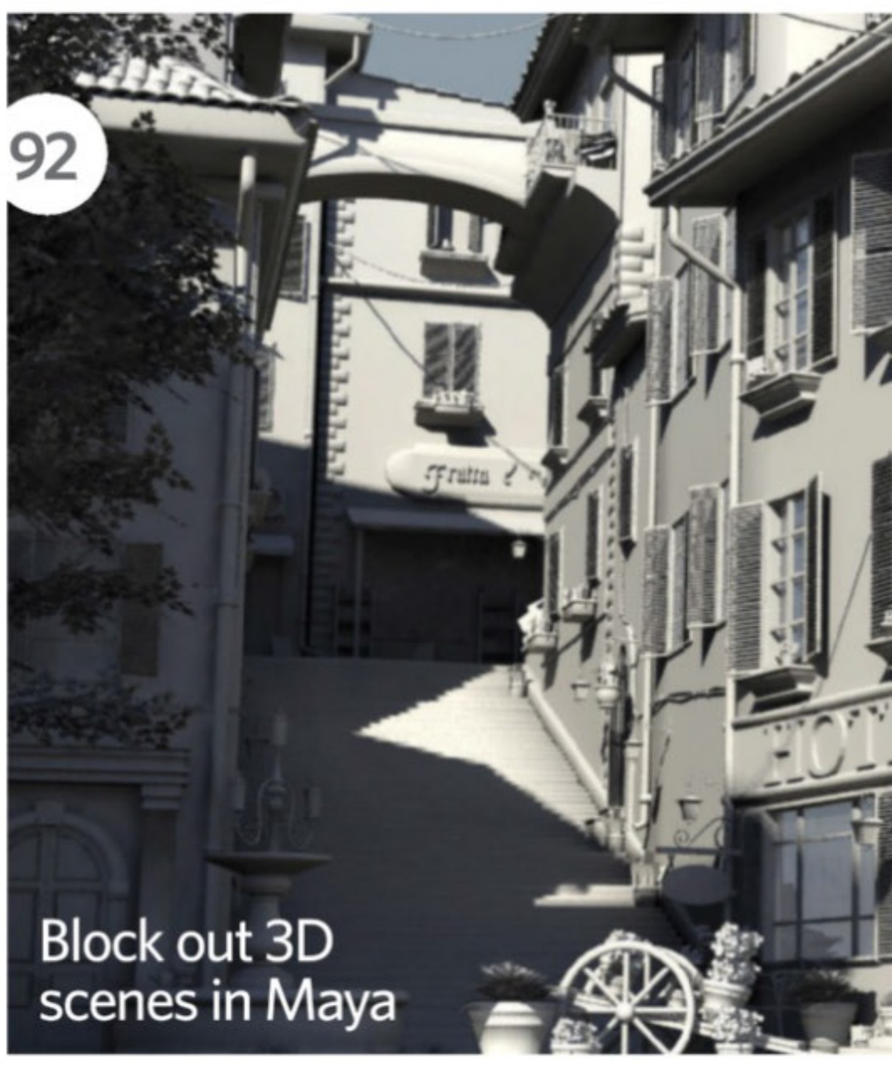

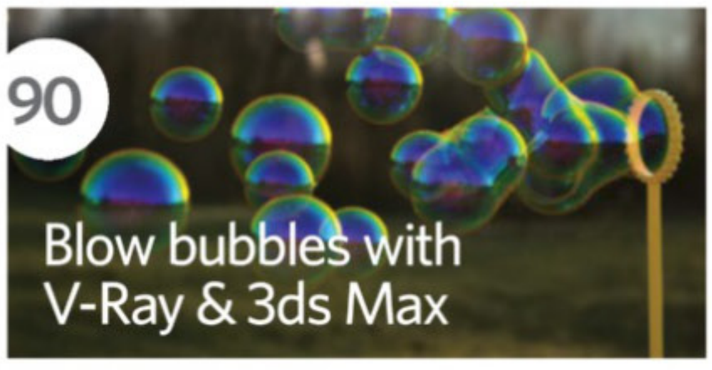

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“Make someone need you and be willing to do whatever job, no matter how small it seems”

Marta Marks, Senior artist manager and recruitment, Reel FX **Page 24**

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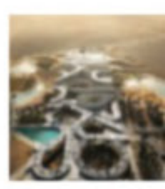

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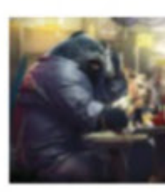

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The Gallery

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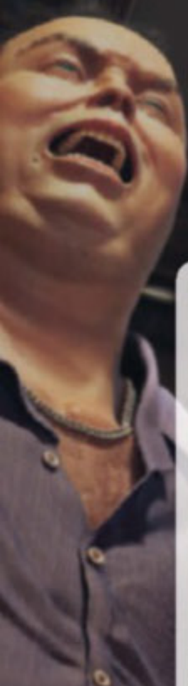


Borhan Chou

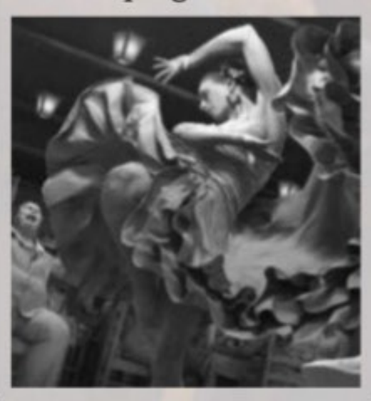
Borhan is an art director at a games company, and he enjoys creating CG in his spare time

Personal portfolio site www.zbrushcentral.com/zbc-user-gallery.php?uid=354790

Country Taiwan

Software used 3ds Max, MakeHuman, ZBrush, V-Ray, Marvelous Designer, Photoshop

Work in progress...



“The idea came from a small Spanish restaurant that my wife and I went to. We ate dinner there, and saw a flamenco performance unexpectedly. The performer’s interactions with the audience were so good that I wanted to show this in my work”

Borhan Chou, *Flamenco*, 2014

Oleg Memukhin

Oleg was a modeller at a studio in Moscow, but moved to Canada to pursue his dreams

Personal portfolio
artstation.com/artist/monkibase

Country Canada

Software Blender, V-Ray, Maya, ZBrush

Work in progress...

"With this work I wanted to create a very detailed creature design with a realistic render instead of my usual cartoon style. I also wanted to try out a sci-fi style, which I have never done before" **Oleg Memukhin,** *Intergalactic Music Pilot*, 2014

“My friend Miroslav Petrov invited me to contribute as a guest artist to his art book, *The Art Of Miro Petrov,* which will be released in October. The inspiration for this was the teaser for *The Boxtrolls*”

Borislav Kechashki, *Haidutin,* 2014

Borislav Kechashki

Borislav has been a 3D character artist at Ubisoft Sofia for the past three years

Personal portfolio www.b_kechashki.artstation.com

Country Bulgaria

Software ZBrush, 3ds Max, Photoshop, V-Ray

Work in progress...

Cezar Brandao

Cezar has worked on Guillermo Del Toro's *The Great Calamity*, *Halo 4*, *Skyforge* and other titles

Personal portfolio www.drawcrowd.com/branduarte

Country Brazil

Software ZBrush, Photoshop

"I was looking to create a very simple image in which I could explore my feelings for the piece, as I wanted it to be pure feeling. So when you look at the image, the first thing you would see is her expression and her sadness"

Cezar Brandao, *Pure*, 2014

John Park Felicsovich

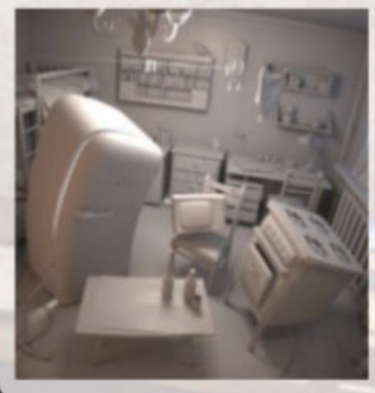
John is a 3D artist who primarily works on low-poly creations, as well as creating big scenes

Personal portfolio
www.behance.net/KLICKSTOP

Country Russia

Software 3ds Max, ZBrush, Photoshop, V-Ray

Work in progress...



> I normally use 3ds Max for modelling and rendering, and this project was no exception. My final image was rendered in V-Ray then post-processing was done in Photoshop

John Park Felicsovich, *TV Refrigerator and Stove*, 2014

Aldo Katayanagi

3DArtistonline

Username: aldokatayanagi

Personal portfolio
www.aldo-art.com

Country USA

Software ZBrush, KeyShot, Photoshop

Work in progress...

> This image is part of an ongoing comics project. The workflow I've developed has influenced my less-stylised illustration work on IPs such as *Star Wars* and *The Lord Of The Rings*

Aldo Katayanagi, *Life at Home cover*, 2014

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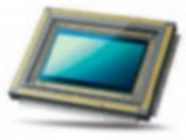
Introducing Blackmagic URSA, the world's first user upgradeable 4K digital film camera!

Blackmagic URSA is the world's first high-end digital film camera designed to revolutionise workflow on set. Built to handle the ergonomics of large film crews as well as single person use, URSA has everything built in, including a massive 10-inch fold-out on-set monitor, large user upgradeable Super 35 global shutter 4K image sensor, 12G-SDI and internal dual RAW and ProRes recorders.



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Blackmagic URSA PL

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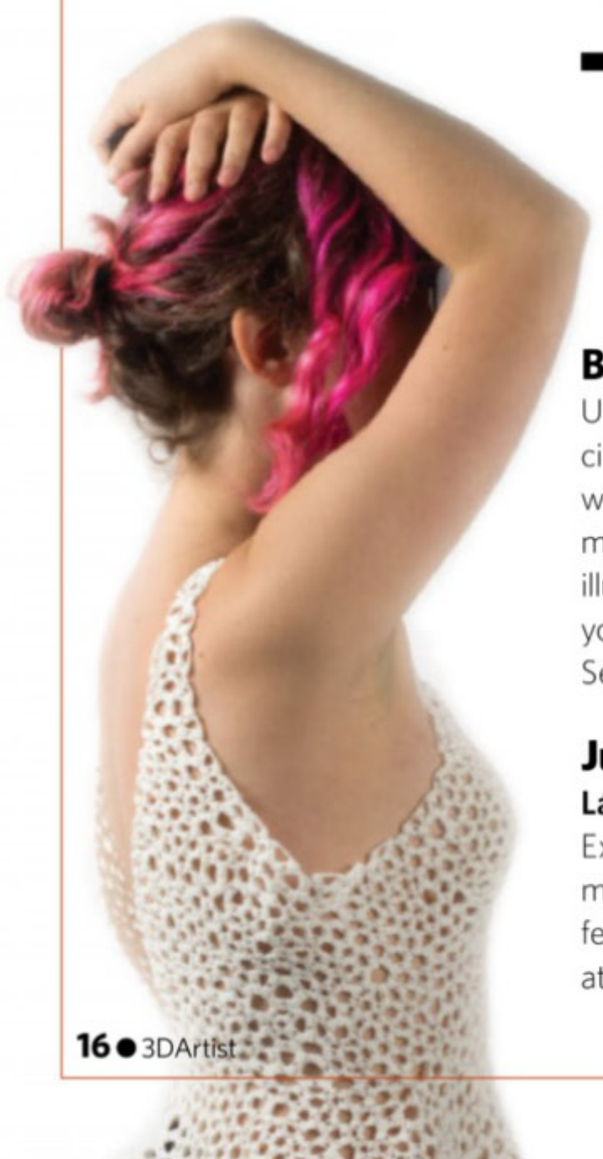
MAIN For an in-depth account from Framestore's FX, compositing, and CG sequence supervisors, head back to **3D Artist** issue 62 to read more

TOP The moonwalking pony – who was affectionately dubbed Socks by the team – was created using MPC's in-house Furtility tool, a hair program that has been used on many of its film projects in the past

BOTTOM LEFT Winning the Best Vizualisation & Simulation award, 'Kinematics' wowed the jury. For more information about it, visit the website at **www.n-e-r-v-o-u-s.com/kinematics**

The world's best animation

We take a closer look at the incredible artists that won at the SIGGRAPH Computer Animation Festival



This August's 41st annual Computer Animation Festival in Vancouver showcased more than 100 of the best examples of work from the past year, accepted out of over 450 submissions SIGGRAPH had received. Out of the hundreds screened, only nine final winners from the festival were ultimately announced.

Best in Show 'Box', directed by Tarik Abdel-Gawad

Using the same Bot & Dolly robots that powered the incredible cinematography behind *Gravity*, 'Box' explores combining both what is real and what is CG through projection-mapping on moving surfaces, ultimately creating mind-boggling visual illusions. It now boasts over 3 million views on YouTube, where you can see it at www.youtube.com/watch?v=IX6JcybgDFo. See it on Vimeo at www.vimeo.com/75260457.

Jury Award 'Paper World', directed by Dávid Ringeisen, László Ruska, Moholy-Nagy University of Art and Design

Excitingly, 'Paper World' is actually a graduation project, making it the third student film to have won an award at the festival this year. Not only that, the two who created it were attending a Hungarian school: MOME Budapest.

Made for WWF Hungary, the short's central motif is the relationship between our strain on the environment and the natural world. "For modelling we used 3ds Max, then from pre-vis until the final animation we managed the scenes in Maya, while rendering was done with V-Ray," explains Ringeisen. "After graduation, we sent the film to a few festivals, but knew it would be one of the greatest accomplishments if the film would be selected for screening at SIGGRAPH. Winning a prize was way beyond our imagination."

Best Animated Short 'Home Sweet Home', directed by Pierre Clenet, Alejandro Diaz, Romain Mazenet, Stéphane Paccolat, Supinfocom Arles

From students at a perhaps more well-known school for SIGGRAPH attendees, Supinfocom Arles, comes the Best Animated Short winner this year, 'Home Sweet Home'. "The story takes place in the heart of the economic crisis, in an American suburb deserted by its inhabitants," reveals Clenet. "A young house wakes up one day, and simply decides to leave. 'Home Sweet Home' tells a part of the journey of this house, the encounters he will have and the friendships that are born." Find more information about this creative short on the website at www.homesweethomethefilm.com.

Best Student Project 'Wrapped', directed by Roman Kälin, Falko Paeper, Florian Wittmann, Filmakademie Baden-Württemberg

Created by the same Filmakademie Baden-Württemberg student team that produced the playful 'a.maize' trailer for FMX Stuttgart in 2011, the Best Student Project winner this year was what they graduated with, 'Wrapped'. With strong imagery and great VFX, the project showcases our cities in a never-ending interplay of eating and being eaten as nature takes over.

Best Visual Effects ***Gravity*****, Directed by Alfonso Cuarón, Esperanto Filmoj, VFX work by Framestore**
After having won this year's VFX Bafta and Oscar, as well as six VES awards, it comes as no surprise that *Gravity* made it on the SIGGRAPH list. To create the ground-breaking visual effects for the film, Framestore developed a whole new workflow – resulting in a feature that was shot almost entirely without the use of greenscreens, and where actors were filmed using robots. For the exterior space scenes, everything except the actors' faces is a digital creation.

Best Visualization & Simulation 'Kinematics', directed by Jessica Rosenkrantz, Jesse Louis-Rosenberg, Nervous System
The video that won the Best Visualization and Simulation category explained 'Kinematics', a system that enables users to design and simulate flexible structures for 3D-printing everything, from jewellery to custom clothing designs. Every design is computationally folded using rigid-body physics so that they can be printed in one sitting as smaller forms. If you want to see the Kinematics customisation app, head over to www.n-e-r-v-o-u-s.com/kinematics or have a look at the free Kinematics@Home version: www.n-e-r-v-o-u-s.com/kinematicshome.

Best Game ***The Crew*****, directed by Maxime Luère, Dominique Boidin, Rémi Kozyra, Unit Image**
Unit Image's fully CG trailer for Ubisoft certainly deserved to win for this place, with a spectacular amount of work going into modelling, lighting, texturing and animating every detail – even background props, bolts, and wires – to perfection. Combined with a high-speed chase action sequence, it was the perfect trailer to highlight both the features of the game and multiplayer elements of its gameplay. See the trailer at www.vimeo.com/68382468, or the making-of video at www.vimeo.com/74111335.

Best Real-Time Graphics ***Ryse: Son Of Rome*****, directed by Chris Evans, Peter Gornstein, Martin L'Heureux, Crytek**
With *Ryse: Son Of Rome* confirmed as one of the first titles available for Microsoft's Xbox One, Crytek took full advantage of the next-gen console and focused on creating real-time characters with a whole new level of fidelity. An eight-hour game with an additional 110 minutes of linear storytelling content, the *Ryse* submission showcased both gameplay and cutscenes that could be rendered in real-time. See more at www.crytek.com/games/ryse.

Best Commercial Advertisement 'Three, The Pony', directed by Dougal Wilson, Blink Productions. VFX work submitted by MPC.
Ever wanted to watch a Shetland pony moonwalk to Fleetwood Mac's *Everywhere*? Thanks to MPC, anyone could with the 'Three, The Pony' campaign. "One of the biggest challenges was getting the movements to look totally realistic, which was difficult, considering ponies never moonwalk!" explained VFX creative director Jake Mengers. A digital double of the pony was created in CG to enable the team to cut between CG and reality, with very precise attention to detail ensuring the matches were seamless.

> "After graduation, we sent the film to a few festivals, but knew it would be one of the greatest accomplishments if the film would be selected for screening at SIGGRAPH"
> **Dávid Ringeisen, 'Paper World'**

TOP *Ryse: Son Of Rome* won the Best Real-Time Graphics award at the Festival, thanks to its incredible submission, including 110 minutes of linear storytelling

LEFT Watch the teaser for 'Paper World' at: **www.vimeo.com/paperworldfilm**, or see the development blog at **www.pandadiploma.blogspot.co.uk**

The team behind 'Home Sweet Home', who are now all working at animation studios from London to Shanghai, tell us that SIGGRAPH was a great opportunity for everyone to reunite

How to design and print your own iPhone case

Winner of the **3D Artist** Award at My Mini Factory's iPhone Design Competition, Pixelseppa explains what goes into designing consumer objects in 3D

What first got you interested in 3D printing and design?

I have been working in and around the 3D scene for over a decade now. I started out in college with AutoCAD. It wasn't the easiest of programs to model with – it was still co-ordinate driven – but AutoCAD was a great platform to build from. I've worked in an assortment of jobs from product development to game-style assets and characters.

I got interested in 3D design while watching and talking to a colleague [who was] programming a CNC machine. He showed me some designs he'd made for a CNC-machined guitar. That was the point where I thought 'this is what I want to do'!

How did you come up with your steampunk entry for the iPhone design competition?

I wanted to come up with a design that used a lot of different elements that worked together and gave the illusion of detail and depth. After a few hours brain-storming in Photoshop, I looked at the shapes that I liked, such as cogs and floral designs. [My product] Steamed Apple came out of that process.

Were there any design decisions that you had to cut back on in order to enable the design to be 3D printed?

The whole workflow was between Photoshop and ZBrush. I created most of the Alphas in Photoshop, some of them for projecting detail, and some to create geometry with ShadowBox. That was it – simple, but it worked for what I wanted to do. Overall, I did actually have to cut back on the design. I had a few pipes and braided hoses attached to gauges, which had to be removed.

What advice would you give to another 3D artist interested in designing consumer objects to 3D print and sell?

I try to keep in mind four basic rules:

1. Check the wall thickness.
2. Make sure your model is watertight.
3. Delete any duplicate edges.
4. Check your normals.

ZBrush, Photoshop, and Netfabb were the three tools used to develop the iPhone cover before it was 3D printed by My Mini Factory for the competition

3D artist and designer Pixelseppa's steampunk-themed iPhone cover, which played on the famous Apple logo on the back, won the **3D Artist** Award

New
HOW IT WORKS
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The surface of the Earth is made up of many different pieces called plates. These plates fit together just like a jigsaw puzzle

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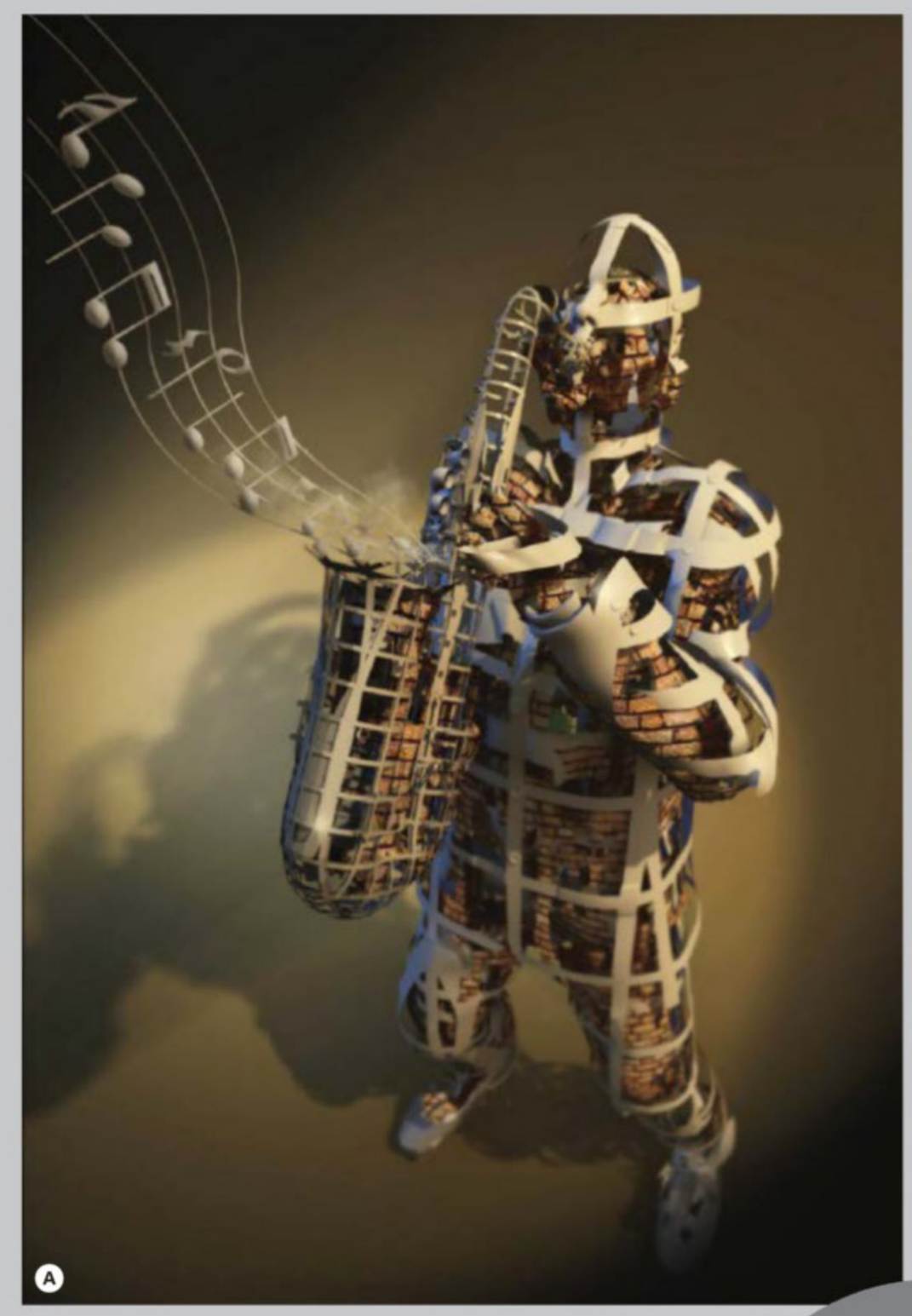
A

Images of the month

These are the illustrations that have been awarded Image of the Week on 3DArtistOnline.com in the last month

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www.3dartistonline.com
to view the art and chat to the artists

A Wired
» Robert Schlenker
3DA username uba
Robert says: "Jazzman playing the sax began as a Poser figure imported into Vue Infinite. Hypertexture materials were then applied to the figure, creating the 3D model. The scene was rendered using a volumetric spotlight to add a little drama."
We say: *Utilising an array of abstract materials really gives the model a huge amount of personality. Mixed with delicate lighting placement makes for a moody scene. You can imagine this character coming to life!*

B Bells and Whistles
» Tomi Väisänen
3DA username Tomivaisanen
Tomi says: "I gathered tons of reference and did the big shapes first. After that I usually let my imagination fly and stop caring whether it's realistic. If it fits, it works. I used 3ds Max, rendered with V-Ray and compositing was done in Photoshop. It took one week to build."
We say: *The eye is drawn in so many different directions in this image. Almost every inch of the frame is packed with some fascinating detail to analyse. Add to that a great use of perspective and you have a scene that leaps off the screen.*

C Lost and Found
» Stefan Misirdzhiev
3DA username Chesher
Stefan says: "With this image I tried to hint at some sort of a backstory regarding this half-man, half-machine character. I used ZBrush and Softimage for modelling and KeyShot for the final render. It was a fun project."
We say: *This sci-fi soldier could've shot his way out of the latest videogame shooter with its battle-worn uniform and high-tech helmet. Stefan has captured the coolness and practicality that has the makings of a virtual icon.*

D In
» Nesar Alam Ansari
3DA username Nesar
Nesar says: "I focused on lighting in the scene as I felt it was fundamental to making a realistic composition. Other than that, it was a case of making sure I picked the right materials to give it the desired aesthetic."
We say: *This is a photorealistic wonder. The balance of various materials here convinces the eye of the scene's authenticity, while the light pouring in through the window adds to the home setting's subtle realism.*

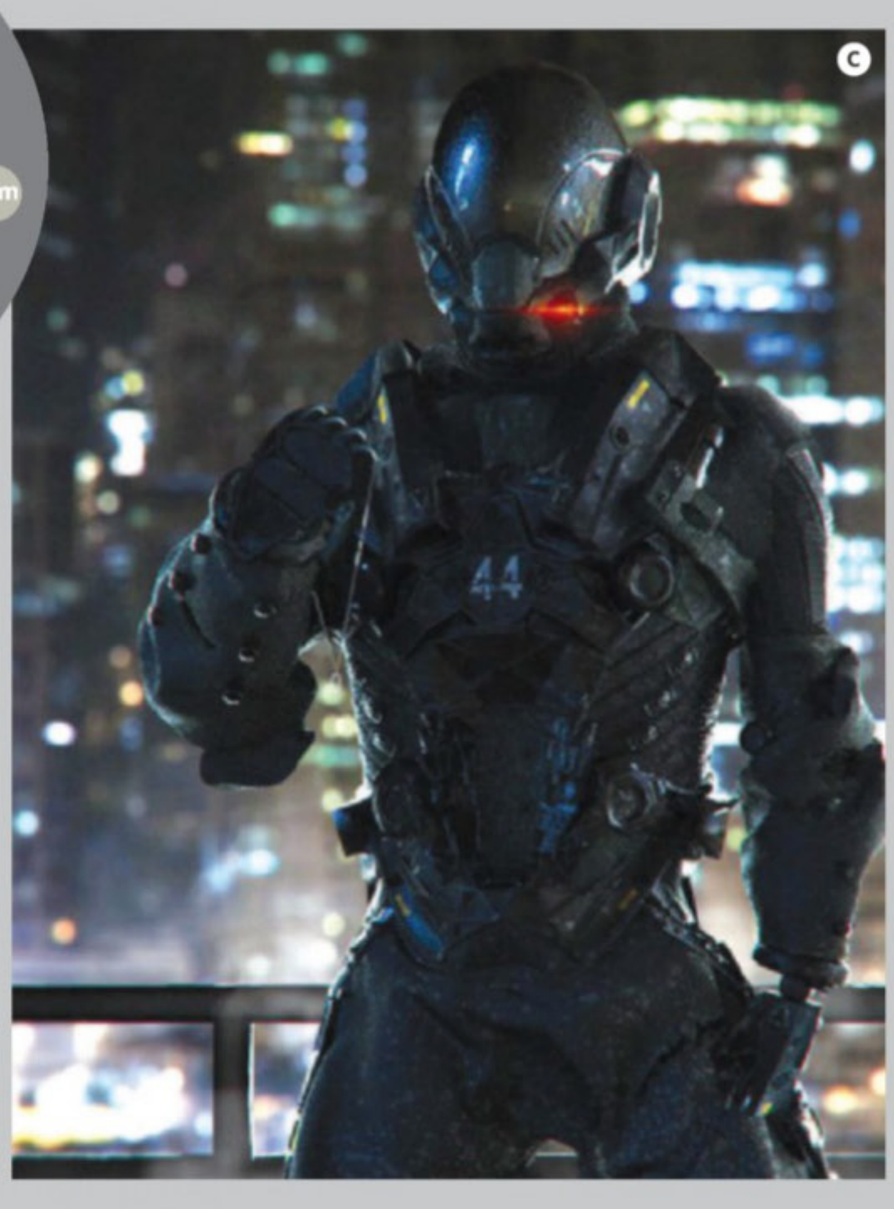
C

Image of the month

Somewhere In...

» **Sompon Chanmantana**

3DA username agency3dbudget

Sompon says: "We got inspiration from the question 'how much do we love our job?'. We kept working until we were happy with the piece."

We say: *Any type of arch-vis work is always a hugely personal endeavour. Artists should remember to not only create a striking piece of architecture, but to design a structure that reflects their own personality.*

Stand Out From The Crowd

» **Joe Pingleton**

3DA username joepingleton

Joe says: "This is an experiment with Carrara 8.5 Pro's surface replicator. I created one sphere with hair attached and two spheres for eyes."

We say: *Sometimes a simplistic idea is enough to stand out and that's certainly the theme behind Joe's image. Paying attention to the body features is key.*

Motel Room

» **Amir Moradi**

3DA username amir_moradi_

Amir says: "This is a personal project to enable me to hone some of my skills. I used a combination of 3ds Max and V-Ray to create the image."

We say: *From the expression on the woman's face to the gun sitting ominously on the stool, there's a convincing narrative behind the image's composition.*

Superior Iron Man

» **Jacob Roark**

3DA username jacobroark

Jacob says: "I'm a huge fan of all things Marvel, so when *Superior Iron Man* was announced, I had to make a 3D version. I used a combination of ZBrush and Maya to build the suit pieces and then rendered in mental ray."

We say: *It's important to be passionate about what you're creating and clearly Jacob's ode to Marvel's tin titan works due to his understanding of the character.*

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16 WAYS TO LAND YOUR DREAM JOB

Getting that first break in the industry is tough, but with the right attitude you can do it. So be polite, be professional and have a plan

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DDB TRIBAL WIEN, AUSTRIA | Photographer/Illustrator: Carioca Studio

Julien Brami
VFX supervisor and creative director, **Massmarket**

Eamonn Butler
Animation director, **Cinesite**

Thilo Ewers
VFX supervisor, **Pixomondo**

David Lebensfeld
VFX supervisor/ founder, **Ingenuity Engine**

Kim Mackey
Head of recruiting, **DreamWorks**

Marta Marks
Senior artist manager and recruiter, **Reel FX**

Jose Martin
3D lead, **Psyop**

Anu Nagaraj
Producer, **Psyop**

Ben Owen
Global head of recruitment, **MPC**

Anna-Marie Payne
Matchmove artist, **Double Negative**

Diane St. Clair
Vice President, Recruiting, Training and Artist Development, **Sony Pictures IPAX**

Alice Tuxford
Senior recruiter, **Double Negative**

Jill Wallace
Studio manager, **Axis Animation**

Jeff Werner
Studio manager, **Method Studios**

16 ways to land your dream job

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01 FIND YOURSELF AN OPENING

Company websites are probably the best place to hear about jobs in the industry. That means you need to be proactive and seek out companies that you'd like to work for, rather than passively surfing general job websites and hoping the right one will leap out at you. Both applying for specific positions (when they are appropriate) and sending off honest, specific emails to HR or heads of departments are generally welcome.

"We also post regular updates for vacancies on our social media links, including across various industry group pages on LinkedIn," says Jill Wallace, studio manager at Axis Animation. Ben Owen, head of global recruitment at MPC tells a similar story: "We are very present on social media, and LinkedIn is the main tool our recruiters use. We want anyone and everyone to connect to us via LinkedIn, it's a great way to find out what's happening at MPC and it's the first port of call for us whenever we have new shows and new opportunities coming up... We want to make it as easy as possible for candidates and talent to connect with us."

Going to industry events is another way that you can connect with the bigger companies. "I'm happy for people to approach me at talks and conventions," says Eamonn Butler, animation director at Cinesite. "But applying online is the best way of making sure your details won't get lost and your application will get reviewed."

02 FROM ZERO TO HERO

There's no point graduating and immediately applying for a senior position, even if you are incredibly talented. The entry-level positions a company offers vary widely, so again, do your research. At Pixomondo, the structure starts as an intern, then trainee, junior, artist, a mid-level artist, a senior/lead artist and finally a supervisor. VFX supervisor Thilo Ewers adds that a "basic knowledge in the software we use per department is necessary to start as an intern".

At DreamWorks, "entry-level positions come up regularly so the best approach is to keep an eye on the Careers portion of our website", says head of recruiting Kim Mackey. "Even if the job posting doesn't specify that it is a junior position, don't hesitate to introduce yourself as we are always keeping an eye out for emerging talent."

You don't have to feel disheartened that you haven't already got some experience on your CV. "If you are fresh out of school you might ask 'how do I get these references without having a job'. Well, look to your professor at school," explains Marta Marks, senior artist manager and recruiter at Reel FX. "Studios have relationships with numerous colleges and we value your professor's opinion. They are very honest with us and will tell us who is a superstar, and who is not. This is another reason to do well in school and make sure you aren't just the quiet student in the back row. Participate!"

03 GO THE EXTRA MILE

"When my apprenticeship was coming to an end I was the only one out of 15 that stayed on full-time at that company. Why? Really, it took me being assertive throughout the three-month program and making them realise that they needed me on their team. The little jobs that no one else wanted to do? Think cleaning out the prop closet at a live-action house every week. I volunteered.

"Reorganising the entire tape library and being stuck in a box of a room for a few weeks? Done! Errands needed for a shoot? Me please! Pretty soon I was included on shoots as more than the training apprentice because I earned a reputation as a hard worker that could think on her feet and get things done before the director would even ask for it. Make someone need you and be willing to do whatever job, no matter how small it seems." **Marta Marks, Senior artist manager and recruiter, Reel FX**

04 GETTING INTO THE BUSINESS

There's no magic key, no secret formula: getting your big break requires perseverance and professionalism

Step 1 Be company and country specific

"Find your target company, see if they want a specific format of reel or portfolio and then put all your effort into making it great... In Spain, for example, it's common for people to include their photo at the very top of their resume, but in other countries this practise is rejected as it could lead to some sort of bias or discrimination. Also, there is a difference between countries regarding the number of pages you should include. In Spain and in the UK you can send two, but in the US one is preferred." **Jose Martin,** 3D lead, **Psyop**

Step 2 Be clear

While you may have plenty of work that you want to present to potential future employers, bombarding them with your work and experience won't necessarily land you the job you've always dreamed of. "Always make sure your resume and reel are clear and present who you are as an artist. Some resumes can be very cluttered and distracting, so keep them simple but detailed. Reels as well – please put the work that represents what you want to do first and foremost and only choose your best work to capture our attention." **Jeff Werner,** Studio manager, **Method Studios**

Step 3 Be professional

"Make sure you have a firm handshake and look a person in the eye when you meet. It seems simple, but it's important. This goes for men and women... Check your appearance as well. Reel FX is a casual environment, as are many studios, but you should look nicer than we do on interview day. This doesn't mean suit and tie but don't come in your workout clothes with bed head. And always show up ten minutes early for an interview but don't expect it to start early." **Marta Marks,** Senior artist manager and recruiter, **Reel FX**

Coming to an interview ten minutes early and dressing fairly formally – though not necessarily in a suit and tie – is an important part of the hiring process for ReelFX's Marta Marks

05 DON'T FUDGE, DON'T BAD-MOUTH

"We often get showreels that don't clearly show us what the individual has done. So if they have worked on a large VFX project, it's highly unlikely that one individual is responsible for all the work in a given shot, and giving us the final shot makes it harder for us to see what that artist has done. It's a pet hate when they don't break down the shots on the showreel – it is about making it as easy as possible for us to employ someone.

It's time wasted if we have to go back and request a breakdown, so providing it along with the reel, or even if it's just embedded in the showreel, just a few words about what they've done and what might have been picked up by other artists. Another pet hate when it comes to the interview process – and it's something that happened this week to one of the recruiters here – is when candidates are negative about their past experience. They may not have had a good experience at another studio, but we don't really want to see them looking at any of their experiences in a negative light, we'd rather they put a positive spin on it. It just makes it easier to see them joining a similar team environment." **Ben Owen,** Global head of recruitment, **MPC**

06 BE AMBITIOUS

"I would tell new job seekers to take on more work than you are comfortable with and find a way to pull it off – you will grow. That's how our studio got started. Be a little okay with taking risks if you can, work for young and new clients or studios that you feel like you can expand or progress to get your foot in the door. If you are going the route of big studios, don't settle for anything less than what you are worth or what you are legally entitled to. Having said that, Ingenuity was started by working hard and doing more than what was expected of us, and even sometimes budgeted for, and a lot of the times paid for..." **David Lebensfeld,** VFX supervisor/ founder, **Ingenuity Engine**

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16 ways to land your dream job

07 ENHANCE YOUR PORTFOLIO

The experts explain how to present your best at its best

Step 1 Keep it simple

"On your cover letter, state your name, contact details, what roles you're interested in, why you want to work for the company. Resumes should be a clear list of education and work experience. When applying for running roles, all work experience is good to see, and when looking for artist roles, VFX experience is what we want to see." **Alice Tuxford,** Senior recruiter, **Double Negative**

Step 2 Reel time

"I recommend putting together an online portfolio or website and listing the link on your resume. This allows you to reach the largest audience for your work and helps make sure you are being considered for any and all opportunities that might be available." **Kim Mackey,** Head of recruiting, **DreamWorks**

Step 3 Be professional

"Vimeo links are our preferred method of viewing reels. Always list what you have done in a shot and overlay it into the reel. It's too much effort to cross reference it with a document. We have been burned a number of times by artists being dishonest about what they have done on a shot and then subsequently they have not met our expectations." **David Lebensfeld,** VFX supervisor/founder, **Ingenuity Engine**

08 INTERVIEW INFORMALITY

Clean clothes, clean hair, clean teeth, a smile, strong eye contact and another copy of your CV – that's all you need for an interview, right? Marta Marks, senior artist manager and recruiter at Reel FX, says she likes "to think of the interviews for our junior positions as a test. If you can't hold a conversation over the phone or in person without coming across in a negative way then you won't get the job. Don't know if this applies to you? Ask your friends, or better yet a sibling, to describe you in three words and practice your call with them. It's good to have unfiltered feedback on how you relate to others conversationally".

"Don't be shy," adds Jeff Werner, studio manager at Method Studios. "Let them see who you are and perhaps laugh, share a story. It's great if applicants can display a bit of personality without being too informal. I believe that who you are at an interview is who you will be once hired."

09 BE A TEAM PLAYER

"Someone who is eager and enthusiastic is a must. Even if you are a well-seasoned jaded artist in the industry, at least try to act excited. Also, it's important that the interviewee is someone who will gel with the company culture, with good hygiene and a good attitude." **Anu Nagaraj, Producer, Psyop/Massmarket**

"Their personality is the most important. If we're going to spend the next handful of months together – usually over ten hours a day – we need to get along. I like artists that are motivated, respectful and ready to work within a team setting. Just be polite and happy!" **Julien Brami,** VFX supervisor and creative director, **Massmarket**

10 IT WORKED FOR ME

Recent graduate from the Ravensbourne College of Design and Communication, Anna-Marie Payne reveals how she got her start. "After graduating in Animation, I was fortunate to land myself short contracts working at various games and TV studios, although my aim had always been to work in film. As the industry standard is so high I knew that the most likely way for me to achieve this was with a running job and then to work my way up. I knew a few people who already worked at Dneg, so when they told me that they were going to be hiring runners I set about creating a showreel and CV. When I had more experience, my CV looked more dense and I had more to flesh out my showreel, including personal projects I had been working on at home. I also researched as much as I could about the company. The interview itself was friendly but intense, so I was glad I had prepared so much. A few days later I found out that I had the job.

"After three months running, I was promoted to a reception/admin role, which I was in for another year while training in Matchmove and working on live shots in the evenings before being promoted to a full-time Matchmove position, which I have now been in for nearly two years. The next step up will be into a TD role that I hope to be moving into shortly!" **Anna-Marie Payne,** Matchmove artist, **Double Negative**

11 IT WORKED FOR ME

Now he has *Hugo* and *Game Of Thrones* on his CV, but Thilo Ewers's career started when he was just a teenager. "I was 16 and still in school. I applied for an internship in a TV post-house. There I began to work in computer graphics like small credit sequences, animations and jingles. Soon I realised the potential of all this software and I started doing some FX shots and animation at home. After I graduated school I joined that company as an artist.

"The next stop for me was freelancing. I worked for different companies on all kinds of jobs like commercials, infomercials and movies. I applied to the Institute of Animation and Visual Effects at the Filmakademie. I studied there for about four or five years. During those years I still did freelance work in summer breaks. Right after graduation I joined Pixomondo and I have been there since." **Thilo Ewers,** VFX supervisor, **Pixomondo**

12 BE SPECIFIC

"Always check a company's website for job postings before you start reaching out to the company for a job. There are many times that we just don't have a position that fits a certain skill set. When I receive several emails from someone just wanting a job, without doing their research, that actually comes across as negative. Same goes for applying for jobs online. Don't apply for every single open position on our job boards if they don't all apply to what you can and want to do. I can't even count the number of people that blast-apply to jobs. If you are a junior animator, don't go for a senior animator posting, because you know you don't have what the company is looking for. This can actually hurt your job search in the long run because we can – and do – track everything someone applies for in our system. If you frequently apply for supervision positions, animator spots, light/comp spots, but then also apply for our apprentice program, that either tells me you might be overly confident and lack self-awareness of your capabilities, or you just don't care!" **Marta Marks,** Senior artist manager and recruiter, **Reel FX**

Entry-level positions at DreamWorks come up more often than people think. The trick, says head of recruiting, Kim Mackey, is to keep checking the Careers portion of the studio's website

SPARKS by Stephen Flack / www.steflack.blogspot.co.uk

16 ways to land your dream job

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Ingenuity Engine's work for not-for-profit agency SNWA's spot, Value of Water. Based in both LA and New York, the team is well-known for its advertising creations

13 ENHANCE YOUR PORTFOLIO

Follow these tips to put yourself forward in the best possible light

Step 1 Put it all up front

"Supplying a good portfolio or showreel is key to any application, and a digital portfolio is preferable. As a tip, you can embed any videos and images in the body of your email so we can see them as soon as the email is opened. The easier you make it for recruiters to review your application and portfolio, the better. Also make sure you leave clear contact details (email, phone). It's obvious, but important." **Jill Wallace,** Studio manager, **Axis Animation**

Step 2 The devil is in the details

"I like it when a candidate includes their technical proficiency with the tools that they use. Again, there is no shame in being completely honest and thorough. I care if you have a basic knowledge of Visual Basic and an expert knowledge in Maya. It helps me understand what you are interested in." **David Lebensfeld,** VFX supervisor/founder, **Ingenuity Engine**

Step 3 Break down your breakdown

"I personally dislike when demo reels don't outline what the artist has done. I know the breakdown can be checked, but usually no one has it opened while watching the reel for the first time. Breakdowns should be very clear. A vast shot saying something like 'modelling' doesn't explain what the artist worked on. Did the artist model everything? I've seen too many people hiding their real skills behind poor role titles." **Jose Martin,** 3D lead, **Psyop**

14 BE COOL, BE PROFESSIONAL

"Generally speaking, if you make the interview I already like your work and you're one step away from being hired. The interview will tell me if you can take direction and if you're a decent person, which will help me determine if you can work in a team. If you tick those boxes, it's a done deal! Remember: don't ever use someone else's work in your reel. It's a smaller industry than you realise. When the same shots show up on more than one person's reel, we discount them immediately. Good personal hygiene is always a good thing, especially in the summer heat!" **Eamonn Butler,** Animation director, **Cinesite**

15 STUNTS FOR SUCCESS?

"I had a student sing me a song once, because they were humming while waiting in line. When it was their turn, I said, 'Sounds like you sing. Can you sing something?', and they obliged. It was refreshing to see this energy and fearlessness. You can't be afraid to open up because it leaves an impression and helps you stand out." **Jeff Werner,** Studio manager, **Method Studios**

"When I worked at Disney there was a very talented team. At the end of every project we had a process called baseball trading, where all of the upcoming shows got to see the current artists' reels. One really talented guy, whose work we were all familiar with, decided to submit a DIY video on how to make a massive spud gun using a length of drain pipe, a can of hairspray and a King Edward potato. His demo reel concluded with him shooting the spud 100 yards over his house. He entertained us and got the job." **Eamonn Butler,** Animation director, **Cinesite**

"We get some very jazzy applications. I'd say the craziest one was a student from America sending their work in a full-on wooden chest, with their CV written on old parchment paper, full of fake jewels and their reel hidden inside a fake rock – very pirate-style. It works in the sense that I still remember them four years on, but they didn't get hired. All your effort needs to go into making the work on your reel stand out, not the package that it comes in." **Alice Tuxford,** Senior recruiter, **Double Negative**

16 DON'T PESTER

"When it comes to interviews, it's all about The three As – attitude, ability, availability. If you aren't successful, however, that doesn't mean that you can't try again. Just make sure you don't try again too soon. When a recruiter says they don't have any positions that fit your skills at the moment, it's usually best to ask when would be an appropriate time to check in again. Then stick to that plan. Calling or emailing repeatedly in a short space of time can be off-putting and a distraction from the positions that do need to be filled." **Diane St. Clair,** Vice president, recruiting, training and artist development, **Sony Pictures IPAX**

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JOB TITLE Concept designer
LOCATION California, USA
WEBSITE www.vitalybulgarov.com
TOOLS Softimage XSI, ZBrush, Photoshop
CLIENTS/EMPLOYERS Blizzard Entertainment, Industrial Light & Magic, Intel, Paramount, Metro Goldwyn Mayer, Intuitive Surgical
FILM CREDITS *Transformers 4: Age Of Extinction, RoboCop, Diablo III, StarCraft II: Heart Of The Swarm, World Of Warcraft: Mists Of Pandaria* and *Cataclysm*

TALENT MIGHT NOT GET YOU SOMEWHERE, BUT PERSEVERANCE AND HARD WORK DEFINITELY WILL, AND THAT'S WHAT IS IMPORTANT

ROBOT DESIGN MASTERCLASS

VITALY BULGAROV

The sci-fi master reveals his secrets to creating next-gen robotics for everything from game cinematics and VFX to the real world

TIMELINE

2000 —○ Builds 3D multiplayer levels (maps) for games like *Half-life* and *Counter-Strike*

2002 —○ Starts learning 3ds Max

2003 —○ Wins first award on an internet CG community website

2004 —○ First freelance doing 3D modelling for advertisement and browser MMO RPGs

2005 —○ First freelance for next-gen shooters like *F.E.A.R.* Expansion packs and *Section 8*

2006 —○ Relocates to Moscow to work as a character artist on a next-gen MMO. Continues freelancing for US game companies

2009 —○ Joins Blizzard's cinematics team. Works on cinematics for *Diablo III*, *StarCraft II*, *World Of Warcraft: Cataclysm* and *World Of Warcraft: Mists Of Pandaria*

2012 —○ Works as a concept designer on the *RoboCop* (2014) film

2013 —○ Joins ILM's Art department. Works as a concept designer on the *Transformers: Age Of Extinction* film

2014 —○ Joins Intuitive Surgical, a leading surgical robotics company, as a concept designer

Black Widow tank by Vitaly Bulgarov, a part of the Black Phoenix Project collaboration with photographer Maria Skotnikova

Robot design masterclass

It may come as a surprise to learn that for Vitaly Bulgarov, everything starts not with a sketch, but a written list. "It's literally a list of sentences. I don't really like doodling," he confirms, telling us that for him, having a crystal-clear understanding of the goal for each project is even more important than the software available – and that's why he starts with a Word document.

"Once ideas are in your head they're just abstract, but once you write down something like 'bipedal construction robot', just that will already give you constraints," Bulgarov continues. Of course, even these descriptive lists are not exactly what you would expect.

They're proof of Bulgarov's intimidating level of efficiency and discipline, sometimes even going so far as to detail exactly what he would be creating every ten minutes of his working day. "Every project is a series of actionable steps, and for each step you give yourself a deadline and stick to it – sometimes that's 10 to 15 minutes per part," he explains. "When I tried it the first time it was very hard because you get really frustrated and it just doesn't work. The sooner you learn to respect the deadline, the sooner you realise you need to spend the most time on those three things that will give you 80 per cent success to get right."

Having worked as an artist with companies ranging from Blizzard to ILM, it's exactly this lack of fear at making mistakes that makes Bulgarov so inspiring. "You will never have the perfect mood or the perfect inspiration today, or the perfect toolset, or the perfect lighting," he says. "But if you shift your mindset towards thinking you just need it to be as good as you can with what you have; if you just really know your limit when you're trying to fix something and it doesn't get better, when you can just let it go – it'll mean next time, you'll be more confident coming on to something and for me, that was a very important milestone." Ultimately, it was the start of a journey that would truly prove what years of hard work, incredible focus and, most importantly, never giving up could really achieve.

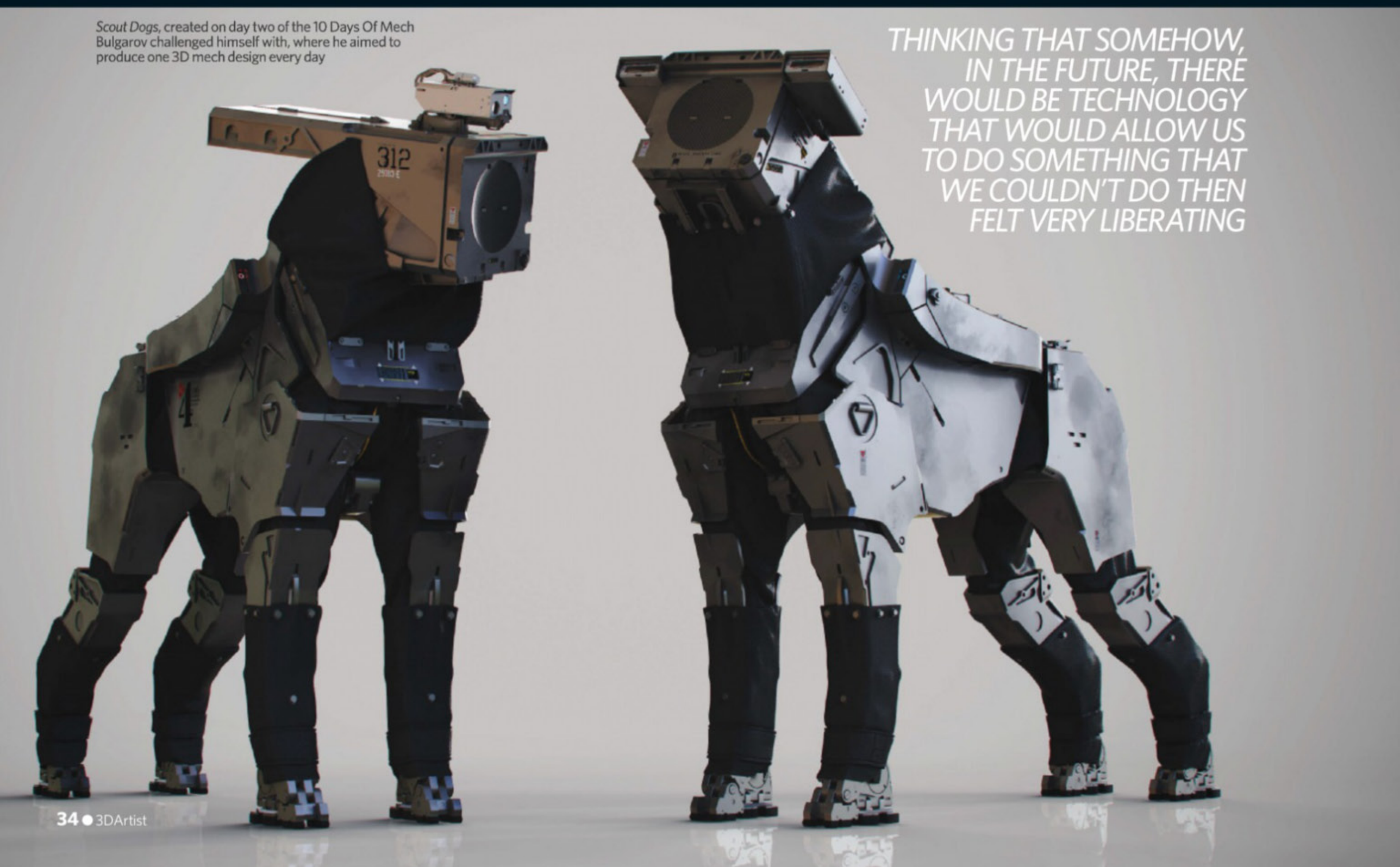
EARLY INFLUENCES

Initially, it was actually games that first inspired Bulgarov to start exploring the world of 3D. "My older brother used to play videogames with me a lot – old-school stuff like *Quake* or *Half-Life* – and somehow we ended up with me making 3D levels for him and him playing them," Bulgarov remembers. "Then one day, I made this level for a shooter game, but it was so heavy and detailed that my computer couldn't compile it, so you couldn't play it. My brother's friend, who was a student that knew about programs like 3ds Max at the time, saw the problem and [suggested that I] try 3ds Max, so that's how it started."

Growing up in a small town in Moldova during the days before the internet, it was a major challenge for a high-school student to teach themselves something like 3ds Max. Top that all off with the fact that the software was in English, which Bulgarov had only a basic knowledge of from school, and he is the first to admit that it took him two months just to realise that there was a Render button on the UI. Even so, a hobby eventually became a passion, and after high school he went to university to study programming on a course that would teach 3ds Max for a few months. "But it didn't work out," says Bulgarov, explaining that the whole time, he had continued to do 3D as a freelancer on the side and eventually ended up realising that he liked art and design much better than he would ever enjoy programming. "I think when I was going to university I knew I wanted to get a degree in something that was related to computers, and after two years I realised that that's not what I wanted to do. Meanwhile, I felt I was getting stronger at 3D, and if I continued learning, pushing and practicing, eventually I would be able to do it well. So, I quit university and I moved to Moscow to work on a film project, and that's how my career in 3D started out.

"Somewhere in the middle of all this I just started doing more sci-fi stuff," Bulgarov continues. "I think that's the coolest because you can really bend the rules of reality. Thinking that somehow, in the future, there would be technology that would allow us to do something that we couldn't do then felt

Scout Dogs, created on day two of the 10 Days Of Mech Bulgarov challenged himself with, where he aimed to produce one 3D mech design every day



THINKING THAT SOMEHOW, IN THE FUTURE, THERE WOULD BE TECHNOLOGY THAT WOULD ALLOW US TO DO SOMETHING THAT WE COULDN'T DO THEN FELT VERY LIBERATING

very liberating to me as I grew up in a very small town, and we didn't travel much. With science-fiction, you could hop on the spaceship and go anywhere in the galaxy."

FROM BLIZZARD TO ILM

What followed was a career most artists would kill for. Ten years since he switched from 3ds Max to Softimage XSI, Bulgarov has also switched between several different industries, working on everything from being a freelance artist to game development at Blizzard and even creating art for films like *RoboCop* and *Transformers* with VFX houses.

In fact, it's his very ability to be a chameleon as an artist, explains Bulgarov, that is part of the reason he's come so far. In an industry that keeps raising the bar of what is possible every six months, there is no time to rely on the same skills and software that you were using five years ago: the only solution to present itself to him was to continuously reinvent himself. "Your pipeline, your tools, your style, how you do things, everything," says Bulgarov. As Winston Churchill once said: "To improve is to change; to be perfect is to change often," and Bulgarov believes that's how to keep your brain alive.

A milestone shift in the way he approached his concept artwork would even lead to what many consider to be Bulgarov's most impressive collection of art yet – the Black Phoenix Project. "That project was a major milestone for me, it helped to understand that I could create concept art using 3D as a primary medium," he remembers.

The idea for it all first came to light while he was still working in production modelling at Blizzard, and wanted to think up a way to collaborate with friend and photographer, Maria Skotnikova. "We were just thinking about what would be the most fun way to collaborate, and we thought 'hey, if Maria makes the HDR maps, and I make models then I could use the maps to render with and use the photographs as back plates', then that would be a good combo." What began as one image soon became a full album and years of work he hopes to one day turn into an art book, all centred around a fictional evil-robotics corporation that develops its products in the future. "It's a good thing and a bad thing. You want to be able to finish a project, but at the same time it's just this playground for ideas!" Bulgarov laughs. With Skotnikova's input, his ideas would take on a new form, being influenced according to the environment the back plate would put them in. For the first time, options he'd never considered, like adding camouflage to a robot, would be plausible as it was in a forest background. "Alone you can be in this closed vacuum," he continues, saying that it all really helped to drive the story like never before. "But together, you can share ideas and expand what you envisaged, it's even just more fun!"

It's ironic then, that it was one of the design exercises he worked on for the Black Phoenix project – 10 Days of Mech – that landed him a new job creating future robotics in real life.

THE BULGAROV CHALLENGE: SPEED VS PERFECTION

"The night before, I would write a plan with the deadline in mind. When I was working I would then use a timer on my phone and whenever it rung, that was it, you need to move to the next thing in the document. Everything in the day is regulated and it's stressful, but you really get things done," says Bulgarov. Before attempting this, however, he advises artists to first gain an awareness of how they really spend their time.

"You think you work eight or ten hours and it's fine, but you'd be surprised how few of those hours are ones in which all you do is work. [You can't count] when you check your mail, [when you] return calls... all you do is work on your list. Some people think it's kind of crazy, but if you spend a couple of days really logging down the hours and minutes that you didn't work and then you start to count up all those hours for one week, you'd be shocked. I personally was horrified at how much time I was wasting, so the obsession with this kind of routine came more out of necessity than just because I wanted to stress myself out! Then it eventually became a sort of sport, I wonder how much I can push myself and how much I can concentrate."

TOP Bulgarov particularly likes creating sci-fi mechs, as he enjoys exploring the visuals of future technologies and concepts that do not yet exist

MAIN Through his Black Phoenix project, Bulgarov understood that concept art could be created in 3D as a primary medium

Robot design masterclass

INTUITIVE SURGICAL

"Intuitive Surgical is a leading surgical robotics manufacturer that creates systems that are designed to help a surgeon do invasive surgery in the most comfortable, efficient and safe way," explains Bulgarov. One of these systems is known as the da Vinci Surgical System. "What's really amazing is that using this tool, a surgeon controls the procedure through a small incision, using extremely precise, state-of-the-art robotic arms to provide a really minimally invasive and safe surgery," enthuses Bulgarov.

The story to what led Bulgarov to start working with Intuitive Surgical starts with another career path that life could have taken him to: the medical field. With both his parents working in medicine – his father now a retired surgeon himself – Bulgarov grew up learning about anatomy from medical books. His parents were hopeful he would become a surgeon. Many years and a successful career as an artist later, Bulgarov began working on 10 Days Of Mech, a session where he would create one full-mech design in 3D every day, without creating any preliminary 2D sketches.

"I was doing these military, scary-looking robots and I showed some to my parents as they were asking me what I was working on... They [asked] 'Why do you always make stuff that hurts people?'" he reveals. "Afterwards, I wanted to make something for them, so for the last days I did this ambulance robot, which was much cleaner as a form. That was the work that got the attention of the guys at Intuitive Surgical!"

Though if anything was the definition of reinventing yourself, this was – particularly after years of working in the entertainment industry – and Bulgarov states he still initially had his doubts. "Initially I was excited to have a chance to check out the systems in person, but I never thought I'd get an opportunity to be involved in developing the next generation of surgical robotics. When they actually showed me what these machines were capable of I couldn't believe how precise it was to use, it blew me away. Then, it turned out that there is a very small niche for me to fit in – very preliminary concept design work for some products they have.

"It's something I'm very excited about and it's been amazing," he continues. "I'm not an engineer, but I work closely with engineers and industrial designers on various tasks, from visualising new products or ideas to refining parts of existing designs. It's more challenging than doing design for entertainment, but it doesn't mean that I'm done with movies or games! I'm at the stage where I had this opportunity to learn in the product-design field, and I want to learn. I was very excited to call my mom and dad and say, 'hey you know what, I have this amazing opportunity to help people with surgery.' They were thrilled."

INITIALLY I WAS EXCITED TO HAVE A CHANCE TO CHECK OUT THE SYSTEMS IN PERSON, BUT I NEVER THOUGHT I'D GET AN OPPORTUNITY TO BE INVOLVED IN DEVELOPING THE NEXT GENERATION OF SURGICAL ROBOTICS

"It was almost two years ago when it first started," says Bulgarov of the Black Phoenix Project the design is part of. "We don't have much time to do it, but we do keep expanding the universe – like a good wine, it gets better over time!"

THE 3D KITBASH STORE

Bulgarov first decided to create his 3D KitBash store as a way to give something back to the community as well as himself. After having practiced hard-surface modelling with his sci-fi designs and robots every day, he eventually ended up with an extensive library of parts. "I was redoing the same parts over and over again every time – and that's how I came up with the KitBash idea," he begins. Even that wasn't efficient enough for Bulgarov, however, as he still had to actually get to the file. "So I started writing scripts where you press a hotkey and it gets a specific KitBash part. For example, a J will be a joint." This enabled him to create robots faster than ever; something that could be useful for more than himself. "I thought why not just organise them, make new ones in one style, and then sell them for a price so that other people can use them for their own projects, like matte painting for an environment or mechanical design," he says.

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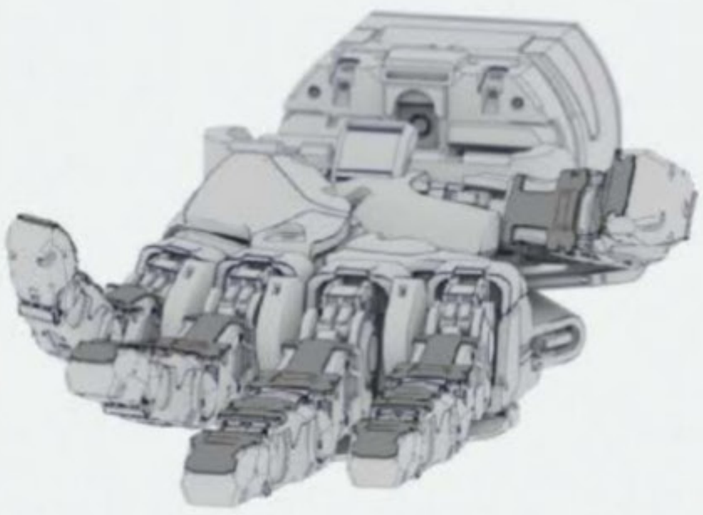

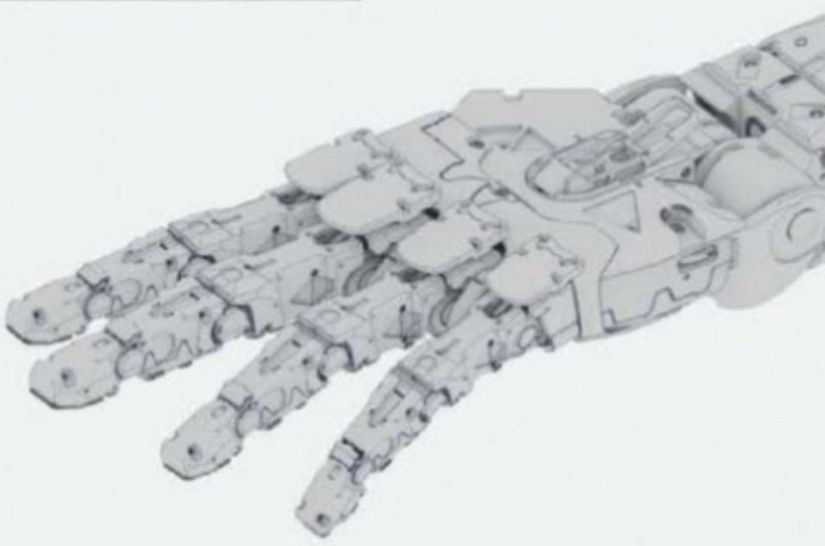

THE IDEAL FUTURE

Bulgarov is certainly now worlds away from the 16-year-old boy discovering 3ds Max in Moldova. Now that he's even helping to make the world a better place through more-precise surgery, it's truly amazing to see how humble the artist really is. "I've had the pleasure of working on so many awesome projects with so many talented people, and all the experiences were really fun – especially some of the cinematics, because I'm a huge Blizzard fan as I used to play those games as a kid," he smiles, telling us how the projects enabled him to rub shoulders with artists that he had admired for years. "I'm very fortunate and very thankful."

As to what he would advise his teenage self if he could take a trip back, Bulgarov says he would have three main bits of instruction. "I think number one is just persistence. Stay persistent and know what you want, and be willing to pay the price for hard work," he begins. "Sometimes you get people talking about talent, but I think talent is overrated. Talent might not get you somewhere, but perseverance and hard work definitely will, and that's what is important."

"The second is that it's this time when all you want to do is party a lot, and it's very hard to find this inner strength and reason to be very motivated, disciplined and focused, but though discipline can be the hardest thing, try your best to apply it. The third is just try to find what you like doing the most. Really find what drives you, moves you, excites you the most, and the earlier you find that the more years and the more stress you will save for yourself as well as your friends and family, as when a person is unhappy, it affects everyone else as well. "

Once you find out what truly drives you, no matter what that is, that's when the work begins. "Even if you just like sculpting faces in terms of just sculpture and traditional stuff," Bulgarov continues enthusiastically. "If that is what you are really passionate about, you learn to draw, to paint, to sculpt and then ten years later you'll be in Weta Digital doing the faces for the new *Planet Of The Apes* movie – which is as great as it gets! If you like robots, then try to do robots really well. You just really need to love it. You should spend thousands of hours practicing and producing art, and then you can complain that you have no talent!"

With a work ethic that means he pushes himself to do more every day, even through the mistakes, it's no surprise that Bulgarov has done just that, and he is far from being finished. "We're very lucky to live in a world where the technology is all converging. You look at some game projects and the graphics are so good that they're becoming more and more like film projects," he explains when we ask him about what he expects for the future. "I think we're getting to the point where the same artist will be able to work in different industries and on different products, and kind of influence it all." If it does happen, Bulgarov explains that he would love to do exactly that – in fact, he intends to. After learning more about product design with Intuitive Surgical, he aims to apply what he's discovered about creating robots and bionics in the real world to films, making everything much more realistic and grounded in reality when it comes to functionality and overall aesthetics.

Ultimately, despite all the challenging deadlines and hard work, it all boils down to one, very important thing. This time, there is no plan. "I'd really love to just keep doing what I'm doing at the same pace," he affirms. "There's no real agenda, just more of the same!"

WORKFLOWS AND TECHNIQUES

Bulgarov's favourite applications for his work are Softimage XSI, ZBrush and Photoshop, a trio of software he's been using for ten years. As for specific tools, his favourites are those that can be applied to do a variety of different things. "Like one hotkey to rule them all," he laughs. "For example, if you have parallel edges and you can just connect them with one hot key. These things are very simple and very easy to remember, all those basic tools that are capable of things like that.

"I also like adjacent selection, and you can repeat it again and again. I use this for adding supporting edges, really reducing the manual labour that comes from just going in and selecting everything by hand. Basically anything that enables me to go faster, I embrace!"

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3D PRINTING THE BOXTROLLS

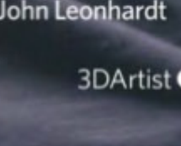
Combining old school stop-motion animation with cutting-edge 3D printing, Oregan-based animation studio LAIKA is pushing the boundaries of what CG animation actually is

***The Boxtrolls* is the third feature film from LAIKA, after its Oscar-nominated animations *Coraline* in 2009 and *ParaNorman* in 2012.** Almost everyone who worked on the latest project – an adaptation of Alan Snow's *Here Be Monsters* – worked on at least one of the studio's previous films, and perhaps being away from core film centres in LA and Vancouver has given the LAIKA team more room to grow and take risks together. "It's so unusual to keep a core team of stop-motion animators for multiple features," says co-director Graham Annable, who worked on *The Boxtrolls* for three years. (The other co-director, Anthony Stacchi, did seven years on the project). "This was our third film down here at LAIKA and we still had the same core group of incredible artists here. Each film teaches us new things and we learn new refinements."

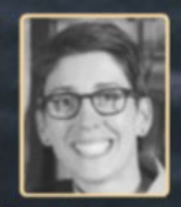
At the heart of the LAIKA method is replacement animation, a variant of stop-motion, where the puppet, or part of the puppet, is replaced rather than remoulded frame by frame. At LAIKA, each new face isn't made by hand, but 3D printed by its innovative Rapid Prototype department.

On *The Boxtrolls*, a funny, Gothic tale about an orphaned boy in the town of Cheesebridge, the challenge was to push the 3D-printing technique further than it had before. The team wanted to create more faces capable of being animated into subtle emotions, to 3D print in colour and to bring to the screen a complicated and distinctive look. As Annable puts it, "The whole Victorian setting is so ornate and detailed... Everything's got a torque and a twist to it. Everything's very tall and elongated." Without 3D printing, it's a world that would have been almost impossible.

All images © LAIKA, Inc.



Graham Annable
Co-director



Tory Bryant
3D colour development texture artist

Brian McLean
Director of rapid prototype

© John Leonhardt

3D printing The Boxtrolls

According to Brian McLean, Tory Bryant was the one who took the 3D printers and "found a way to get some unbelievably beautiful and subtle paint jobs out of them, and found a way to make them repeatable"

Worlds apart

"Alan Snow jokingly has stated that he invented new characters to get himself out of situations," explains Graham Annable, who quickly realised with his co-director that they "weren't going to be able to maintain that for an 85-minute animated feature, but we knew we had to have the essence of what Alan's book had. Every doodle in that book, every description was just jam-packed with tons and tons of good ideas and inventions. It was the challenge of having this big, jumbly world, but still having the clarity of knowing where you were supposed to look in the frame." Creating a sense of space was important for this. "Stop motion has a tendency to feel like it's shot on a small set, because it typically is," Annable notes. "You can only build so much. It's charming and it has its own appeal, but you do feel like you're trapped on a stage. So we did everything that we could to change that feeling."

One of the other restrictions typical stop-motion animation has is that there's only "a handful of characters that are running around", notes Brian McLean, director of rapid prototype. "LAIKA doesn't want to have to be restricted with the stories that it can tell, based on not being able to have a world populated with hundreds of different Boxtrolls running around." The team's attack on this was two-pronged: CGI and VFX are used to extend the backgrounds, and McLean and his team 3D printed all those thousands of character faces, rather than anyone having to create them by hand.

In essence, replacement animation is "taking a frame of film with one expression, and you're pulling that expression off and you're putting on a slightly different expression", explains McLean. "So back on the film *Coraline*, we became the first studio to try taking that age-old technique of replacement animation and combining it with the 21st-century technology that is 3D printing." Once all the usual pre-production jobs have been done – script written, characters designed – LAIKA's CG animators model, rig and animate the characters using Maya, in the same way that any other animation studio would do. However, all the faces created by that animation are then sent to the 3D printer, printed out, cleaned up and then attached with a magnet to the physical puppets that have been built by hand. Those puppets are then taken onto the physical sets and the stop-motion animation team take over.

A physical third dimension

"We've been doing this for three films," says McLean. "Each time we do this we try to find ways to improve the facial animation. Essentially what that means is we're producing more faces. We're getting more and more subtlety; we're getting more and more naturalistic expression. Looking back at *Coraline*, we were getting some wonderful expressions, but really we were just animating by moving the mouth, we weren't doing much with her cheeks. It was a similar story on *ParaNorman*. With *The Boxtrolls*, however, from the main character Eggs and the Snatcher to these little Boxtrolls, they have an amazing amount of subtlety and nuance and musculature and tension. You feel like you're watching real little creatures."

To make that happen, McLean and his 60-strong rapid prototype team printed over 53,000 different face parts for the characters. He explains, "We tend to split the face prints from eyebrow shapes to mouth shapes and then when you put them on the puppet there's a seam line that's visible. That seam line is then erased in post. So because we're printing the eyebrows and the mouth separately, it means that you can have millions of possible facial expressions." The main character, Eggs, has 1.4 million possible facial expressions.

While the essential method has been the same over the three films, it has evolved massively. On *Coraline*, they were using PolyJet 3D printing. "PolyJet is really precise," says McLean. "You can do really beautiful detail, consistently precise parts, but it prints in a type of plastic that's just one colour." While you can choose which colour you use, you are still restricted to one colour and then all of the faces need to be painted by hand. Not only is that time-consuming, but it places a tremendous burden of consistency on the artist. On *Coraline* they had to put on skin tones and paint freckles and lipstick. "It meant we were suddenly able to produce a tremendous amount of facial expressions and an incredible range of acting ability in *Coraline*, but we were always having to watch how complicated the face paint was getting because we knew we would be getting thousands of faces and all of these faces had to match exactly."

For *ParaNorman* they started to explore colour 3D printing, because the technology had developed to the point where the colours were becoming more vibrant. "You were suddenly able to get a really rich black and a really white white," says McLean. Now LAIKA was not only adapting the technology themselves and therefore "doing something unique that no one else in the world is doing", but also "asking these 3D printers to go from prototyping machines to be mass-production machines. We're requiring a level of consistency in both colour and dimensional accuracy that most customers of 3D printers aren't really concerned about".

Going from *ParaNorman* to *The Boxtrolls* was another big step. In simple numbers, LAIKA went from printing 40,000 face parts, to 53,000 face parts. McLean's team was confident enough in the consistency of the 3D prints that it took a big step in terms of the proportions of the characters in *The Boxtrolls* too. Typically, stop-motion characters have

Facial expressions

01 The RP team printed over 53,000 individual face parts for *The Boxtrolls*, and many of these were for the antagonist, Snatcher. Consequently, he had over 1.18 million possible facial expressions.

02 In several shots the camera is close enough to Snatcher's face that it fills the entire screen, magnifying his 1.8 inch-wide face roughly 540 times.

03 The amount of face parts is "far and away the most we've ever had for a villain character at LAIKA", says co-director Annable. "As much as Eggs is the main character, Snatcher had a huge amount of time on the screen, and we really wanted to utilise what we could do in terms of the expressions with him."

04 "Because Snatcher's the villain, he gets some pretty juicy scenes," says Annable. "Really strong, emotive scenes, combined with what that character ended up looking like in terms of design – as well as what Sir Ben Kingsley brought to it – is extraordinary."

05 "We had a lot of conversations with Ben Kingsley about what we thought we would do with Snatcher," adds Annable. "But man, he'd listened to all the conversations, and he'd read through the script, he knew what we wanted out of it and he took it to a whole other place!"

3D printing The Boxtrolls

very large heads in comparison with their bodies to give the animators room to bring them to life. "Yet some of the advancements that we had made with 3D printing meant that we could shrink the heads down, and make them more in line with a natural human proportion," says McLean. "Norman's face was probably the size of a small orange, and Eggs's face is the size of a ping-pong ball." This meant they had to shrink all the internal components, including the elaborate eye rig that resides underneath the face mask, allowing the stop-motion animator to control eyelines, create subtle squints and so on.

Colour conundrums

Tory Bryant, who was a puppet painter on *Coraline*, was 3D colour development texture lead on *The Boxtrolls*, so it was her challenge to ensure that the colour of the face masks was good enough. When she first started on *ParaNorman*, she would get a maquette from the Art department and she'd copy it, using MARI and Photoshop to paint a flat UV map. She would then take the texture map, wrap it on the face and send it to the 3D printer. Early on, she would think "'Oh yeah, these are quite close. I'll have to go photograph them and have a review with the directors'. I would photograph them and gasp at how they now looked nothing like each other." She quickly learnt that there was a chemical called optical brightener in the material of the faces, which looks great in ordinary light, but "if you took it into stage lighting, which had no UV lighting in the light, it was kind of like the face would die." So she would have to go back and forth from the maquette to the photograph to the screen until she got the colour right. "If I got interrupted for a question," she says, "I would look back at my screen and just totally forget what equation I had in my head, what idea I was coming up with to get my model closer to what it needed to be."

Soon enough, however, she began to come up with strategies that worked. "If I took two or three different colours and feathered them together, I could actually mimic that colour through trickery of the eye." As Bryant says, it was all about "getting that luminosity, so that when someone flushes it's not just painting on the surface of a piece of clay, but that it's absorbing the light in a particular way, so that you can see the colouring when the light hits it. You'd maybe do a little bit of green on the back and the rosy red on the front for blush, and it would look like real flesh tones. It was exciting at that point when that occurred."

The story required a lot of grime and dirt on the characters' faces that they really wanted to see the make the most of, and initially the printer couldn't manage the workload. To work around it, Bryant learnt to manipulate the 3D printer. "If I were to add a mark against the face in a dark colour I'd then do a bright red or a bright yellow right against it and the printer would suddenly read the mark, as there was just too much information that it simply couldn't ignore it any longer."

The process by Brian McLean

01 The CG step "In a nutshell, we are building the faces on the computer in Maya. We are modelling them, rigging them, texture-painting them, so we end up with hundreds – if not thousands – of different expressions in the computer, and then we send that geometry, along with its texture and colour information, to 3D printers."

02 Print time "Then what the 3D printer is able to do is that it takes that three-dimensional computer model and builds it up layer by layer, spraying down in a liquid binder on a type of plaster powder. Eventually you'll end up with a three-dimensional object."

03 Clean-up job "We take those faces out of the printer, we clean them off because there's sort of a residual printing powder on there. We brush that off and we clean up the faces, and then there's a pretty elaborate procedure to ensure that the faces are extremely consistent."

04 Time to shoot "The next step is to magnetise them, stick little magnets on the back and stick them on the puppet... when an animator is out on set and they're animating, they have hundreds of faces to replace – sometimes 12 times a second, or 24 times a second, depending on the subtlety."

05 Into post "The characters upfront are real physical things, with lights, with cameras... But oftentimes, things way in the background are augmented with CG. So if you're looking at a shot with 50 Boxtrolls, maybe the first ten in front of the camera are practical, and the other 40 are CG."

01

02

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"We are building the poses in the computer, and then the printer allows us to take these digital assets and suddenly turn them into a physical asset," explains Brian McLean

"It feels very unlike any other stop-motion film I've ever seen," says Annable. "It just feels bigger" © Jason Ptaszek

First-time director Annable admits that he'd "always assumed the Art department took care of the art, and the Puppet department took care of the puppets, but it comes to the directors for sign off" © Focus Features

3D printing The Boxtrolls

"Both *ParaNorman* and *The Boxtrolls* have really cool designs," says McLean, "but *The Boxtrolls* designs required that we tried things that just a few years previously we didn't know if the printers were even able to do" © Focus Features

Stop-motion code

The 3D printers were working almost constantly, but even when the results were perfect, juggling such a large number of components was a challenge in itself.

"There was a very elaborate coding system on the back of each face part," explains McLean. "That coding system was a little language that the stop-motion animators and the CG animators had come up with. For a layman to look at, it just looks like a series of crazy letters and hyphens and numbers, but it's a way that they can very easily look at it and see that pose, that it means something. For example, we may have an 'aho1' face, and an 'ah02', an 'ah03' and 'ah04'. The 'ah' is a label that describes what the pose is doing. That can either be used for an 'a' sound or an 'h' sound."

Because they owned the faces in both a digital library and a physical one, McLean explains that communication between the CG and the stop-motion animators was critical. Before the stage animator would go out on set, he'd sit down with a facial-animation specialist and go through the digital faces library to "create their own unique set of faces that work really well for that shot".

That digital version was called the playblast and they can "scrub through and they can watch in real-time and they can make sure the dialogue is synced up", explains McLean. "They show that to the directors, and if the directors approve it, and say they love the performance choice you've chosen for this line, if it's approved then we basically send off a shopping list to the physical library – for this animator, for this shot, shooting next week, you need to go through and pull out of the library these 200 faces, or these 50 faces."

This means the stage animator knows exactly what they need to do. "For frame 1, you need to put on this mouth shape and this brow shape and you need to hold that all the way until frame seven, when you then swap out the mouth shape. Of course, they have already worked on this with the facial-animation specialist, so they know what they're getting, but this is a very precise thing, this is what you're going to have to do when you're out on set," explains McLean. "The by-product of this is that it means the animator doesn't need to focus on the facial animation anymore. They know that's already been taken care of and they know it looks good because they've approved it ahead of time and now they can really focus all of their energy on the body movement, and the clothing, and the subtle eye movements. At this stage, they're just popping these faces on and off."

The result is that *The Boxtrolls* is an incredibly rich animation, with a beating heart underneath its quirky style. Looking back to *Coraline*, McLean says, "It was cutting-edge at the time and we were really happy with the results, but we knew that on our future films we had to look for something else that would enable us to take that same leap forward that we have been able to in the performance of the character, and do that with the design of the each of the characters." With *The Boxtrolls*, LAIKA has done exactly that, which only really leaves two burning questions: what will the studio do next, and which other animation companies are going to try their hands at 3D printing?

Ten facts

01 With mouth shapes and eyebrow shapes created individually, *The Boxtrolls* team printed out over **53,000** individual face parts.

02 Out of those **53,000** parts, over **13,000** were Eggs's faces. As the film's protagonist, he has over **1.4 million** possible facial expressions.

03 The rapid prototype department used **five** 3D Z650 colour printers and **two** PolyJet printers.

04 If they had only one printer, it would have taken **1.94** years of printing (**24** hours a day, **365** days a year) to produce all those face parts.

05 **379** faces can be printed per day, or **1,899** in one week. The faces for all characters are housed in LAIKA's face library, in over **1,333** archival boxes.

06 The rapid prototype department had over **60** people. That's **13** CG animators, interns and trackreaders, **five** CG modellers, **five** CG riggers, **three** texture artists, **six** practical model makers and **28** people who print, process, and test all of the 3D-printed faces.

07 LAIKA created and printed **1,372** colour chips in order to create its very own 3D-printer colour palette.

08 The most unique faces used in any single shot was **350**, spread across two different characters. The shot, which can be seen near the end of the film, is **44.1** seconds (**1,058** frames) long and took over a month to complete.

09 The rapid prototype team used **10,595** pounds (**4.7** tons) of printer powder and **676** gallons of ink.

10 In addition to that, the volume of 3D printing required **1,900** disposable print heads, **103** gallons of superglue, **104, 249** rare-earth magnets, **1,086** cans of Crystal Clear spray, **66** gallons of coating and **35,000** rubber gloves.

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Personal portfolio site www.sengjoon.com

Country USA

Software used Maya 2013, MARI, Photoshop, ZBrush, NDO, UVLayout, V-Ray

Expertise Sengjoon specialises in high-res 3D art design

Maya sci-fi

Cybernetic Organism Artemis AA 3057 2014

"Learn how to build a fully functional female cyborg"

Sengjoon Song is currently working for Blizzard Entertainment as a senior cinematic environment artist

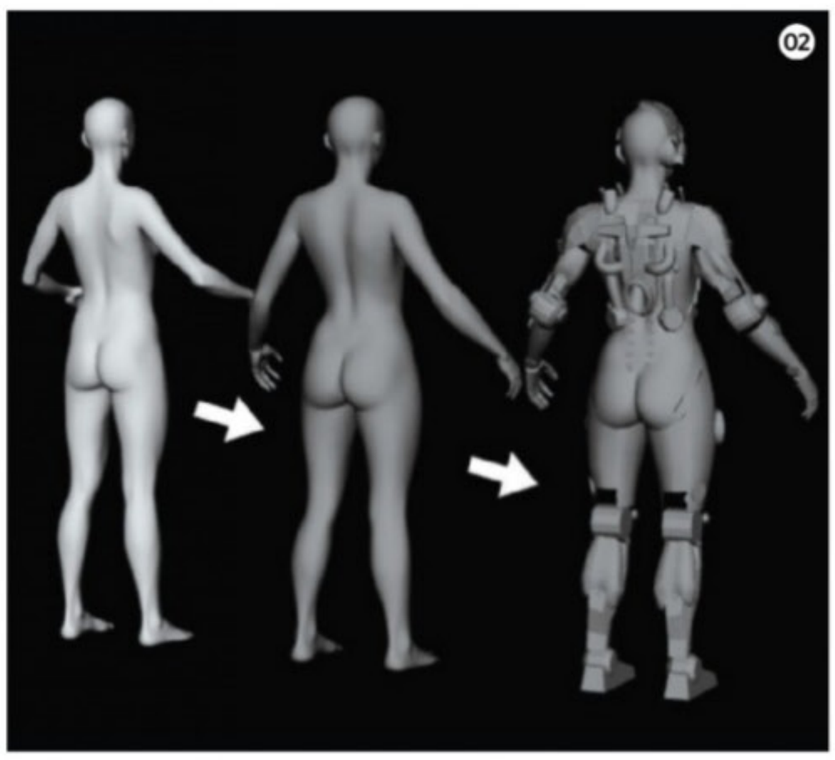
Here I will give you an overview of how I created this 3D model, from conception to completion. In the modelling stage, we will revisit some of the traditional NURBS modelling skills, through which you can create streamlined surfaces with many holes and draw trim lines without breaking any specular on it. I will also share my Maya skills that I use on a daily basis. Next, we'll move on to the texturing stage, where we'll explore some useful MARI features that can help when you're painting a texture map.

Last of all, I will explain how to set up lighting and rendering inside Maya and V-Ray, and we'll consider how to finalise the composition in Photoshop.

01

Other modes of reference

I sometimes use Recap 360, which is a cloud computing 3D-scanning service provided by Autodesk. If you send a series of photos of a particular object in 360 degrees, it will send you a 3D-scanned result of the object. From my experience, this service has worked fairly well and it can become a nice reference to start from.



02

01 Visualise your idea The best way of visualising your ideas is to draw out your thoughts on paper with a conventional pencil. I've found that the first drawings don't have to be totally complete, as an idea is something that needs to be constantly revised. Furthermore, changes are inevitable, as a 3D artist's own interpretation must be implemented throughout the 3D re-creation process. Nevertheless, this preliminary sketch is important because it acts as a guideline that always reminds you of the original idea. Make more varied sketches after you move onto the 3D re-creation process. For *Artemis*, there was only one feature that I changed while drawing her in 3D: I added on transforming high heels. Originally, I drew transforming flippers as her shoes because I wanted her to be able to swim underwater.

02 Block in and build a rough mesh In my project, the body of my 3D model was based on a female anatomy model that had accurate proportions. I made minor adjustments in ZBrush to enhance her body silhouette to look like she was in a tight catsuit. I also referred to photos of female pole vault athletes while I was adding more volume to her muscles, by using the Standard brush with an Intensity set to around 5 to 8. Getting the right proportion is important in this step. After that, I started to place low-poly primitives where I needed to define mechanical parts in Maya. At this stage, it's important to gather as much reference as possible.

Concept

I wanted to create a female cyborg that has mechanical hard-surface parts underneath. Streamlined armour plates cover her to complement her elegant hourglass silhouette.

Learn how to

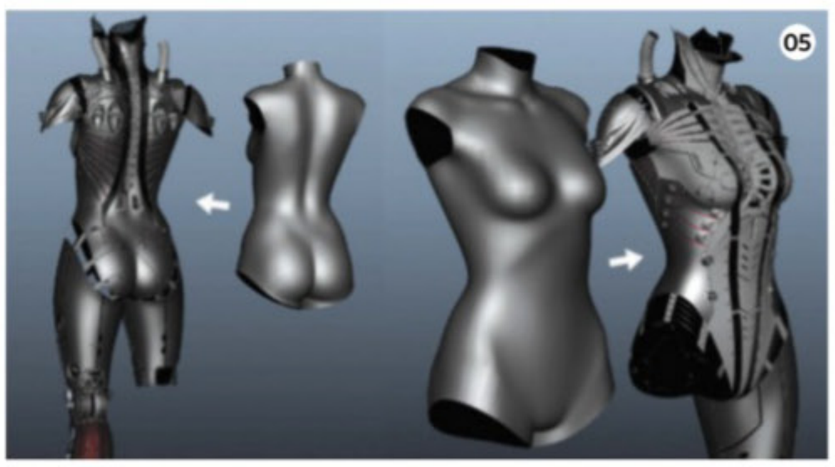
- ☑ Revisit NURBS skills in Maya
- ☑ Take advantage of using hotkeys in Maya
- ☑ Explore MARI features
- ☑ Set up lighting and rendering
- ☑ Composite and retouch with Photoshop

With the Disc

Tutorial files:

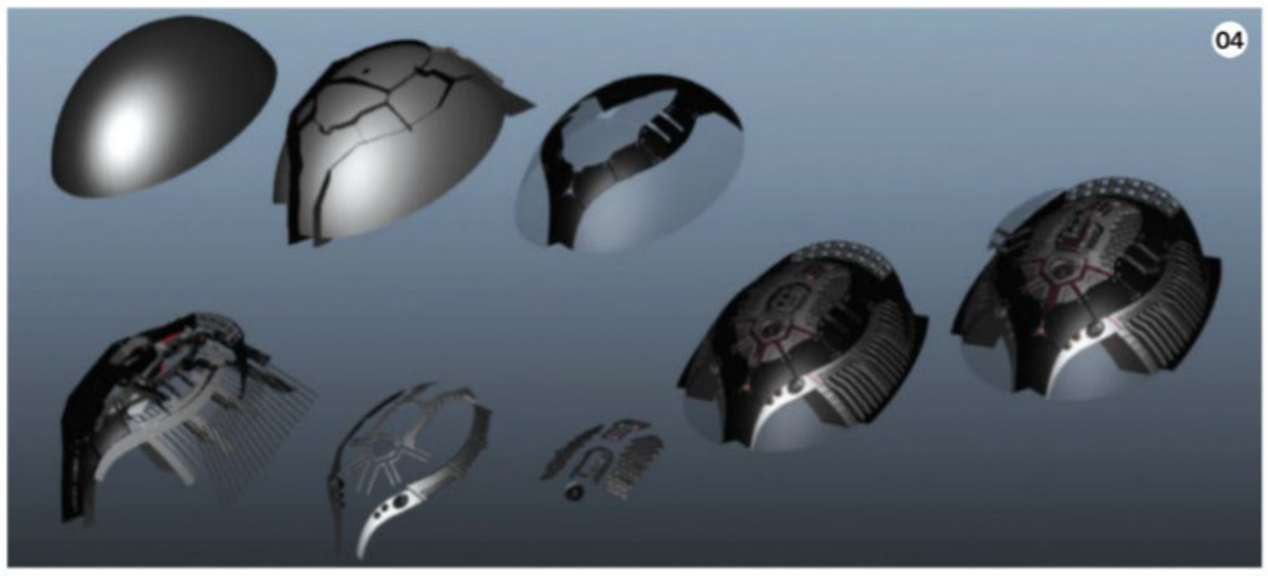
- Tutorial screenshots

03 Use a P2N script Start defining shapes with a very low-polygon object in Maya by simply tweaking vertices and adding edge loops where you want curvature and edge sharpness. Try to make every face a quad, as once the basic larger shape is made on a polygon surface, it needs to be converted into a NURBS surface for more-precise detailing. By default, Maya won't let this happen. However, you can use a P2N script for conversion and with it you can jump back and forth between polygon and NURBS surfaces. One advantage of using NURBS is that you can maintain perfect curvature no matter how many holes are applied to the surface.

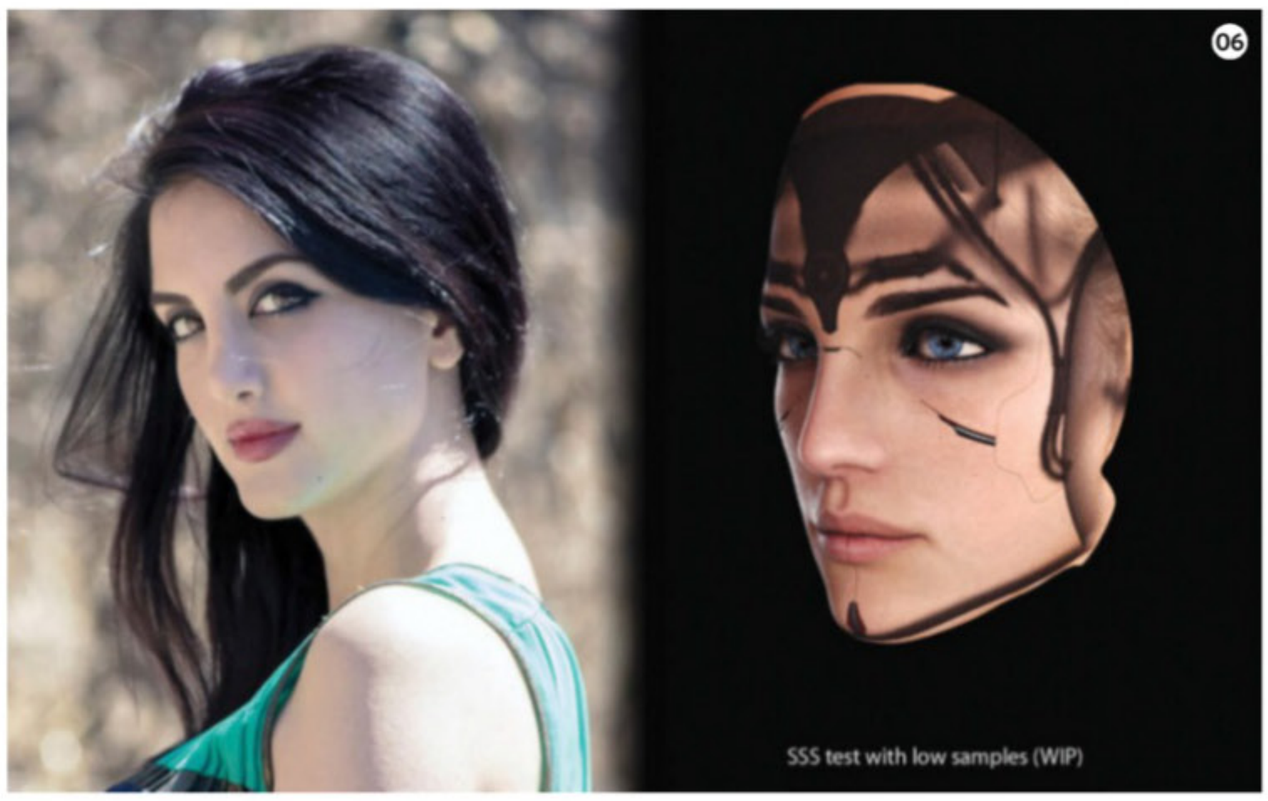


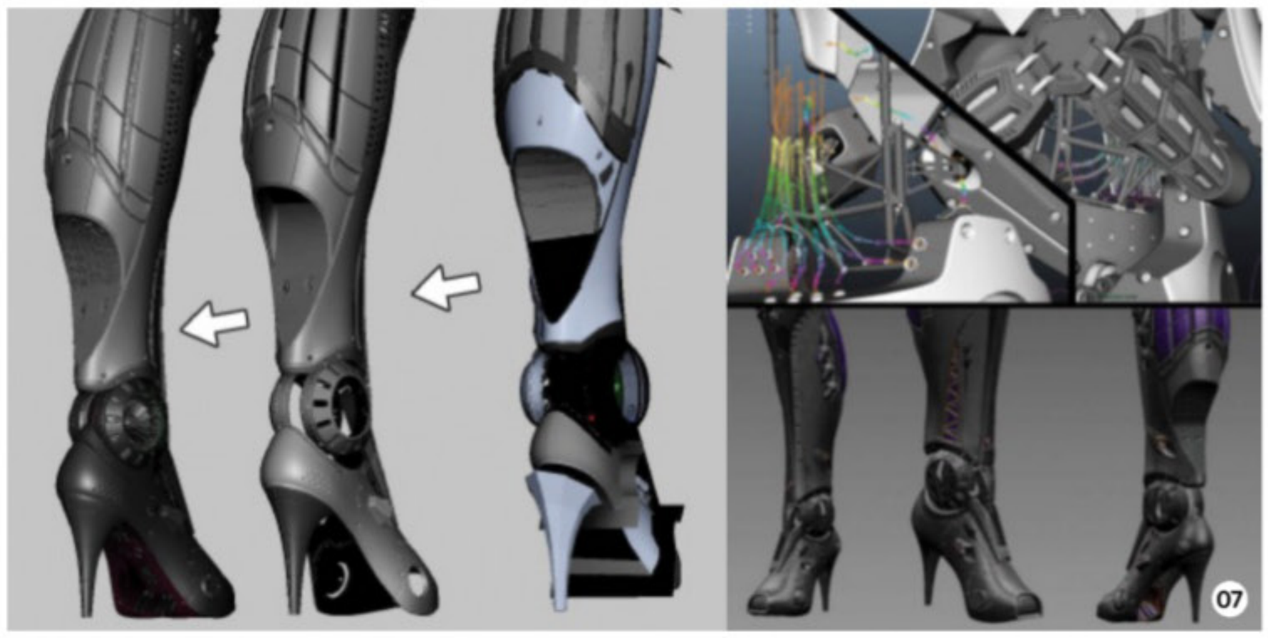
05 Work on the body and limbs All the major trim lines should be created by the NURBS technique and by modulating small bolts. For *Artemis*, one of the major parts that I used numerous times was the knee and elbow joints. These joints share the same mesh and texture. Since we've made a clean topology and wire flow on her body, we can expect that the rigging and weight stages will be much easier. Try to refrain from exaggerating the armour parts and from taking too many decorative parts out of the original concept. The main focus here is to draw the overall lines and curves accurately so that they flow suitably over the model. We'll add the smaller details later on – the ones that were all too minor to be done in the concept-drawing stage.

06 Re-create the face Even when I had finished almost 80 per cent of the mechanical modelling, *Artemis*'s face still remained incomplete as I hadn't yet found an appropriate model. However, I knew that the face of this model would be a huge focal point when it came to presenting the final piece. When I first saw Pooneh, I couldn't have been more pleased. Her face was everything that I dreamed about – she looked like a mysterious and charismatic sci-fi goddess, a muse. I added minor details, such as wires and miscellaneous tech features, but other than that I altered her as little as possible to maintain as much realism as possible.

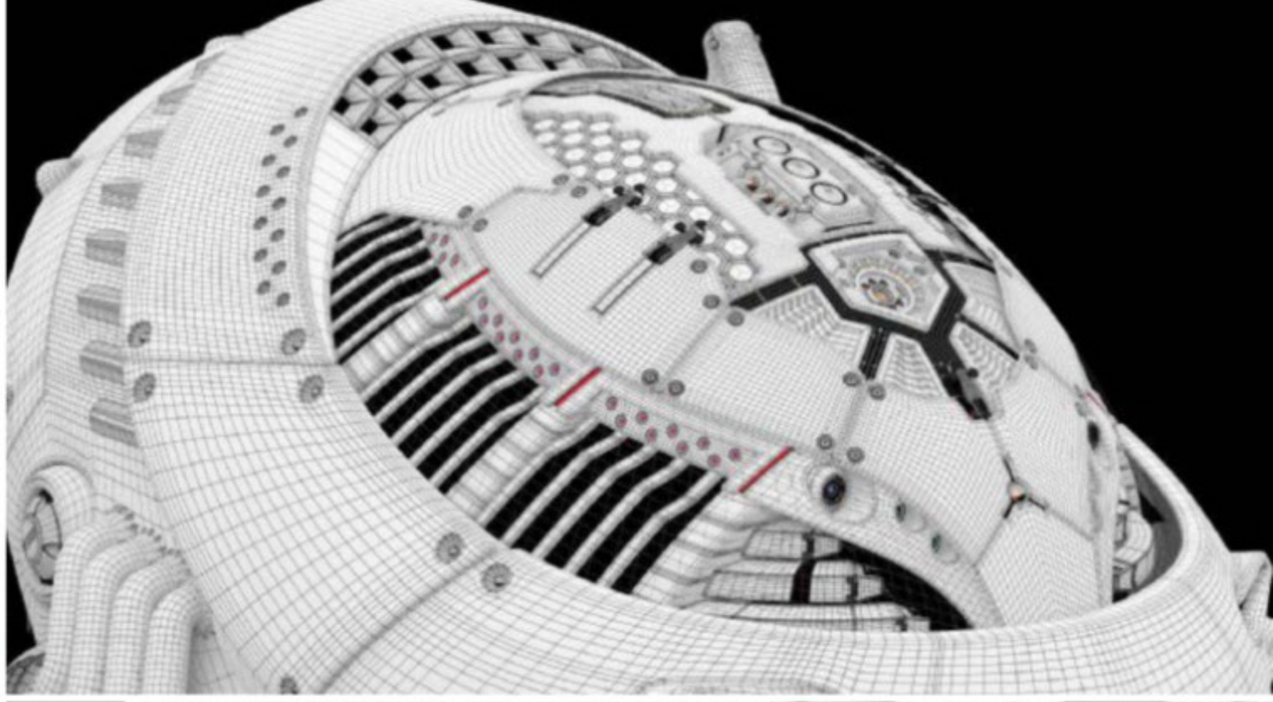


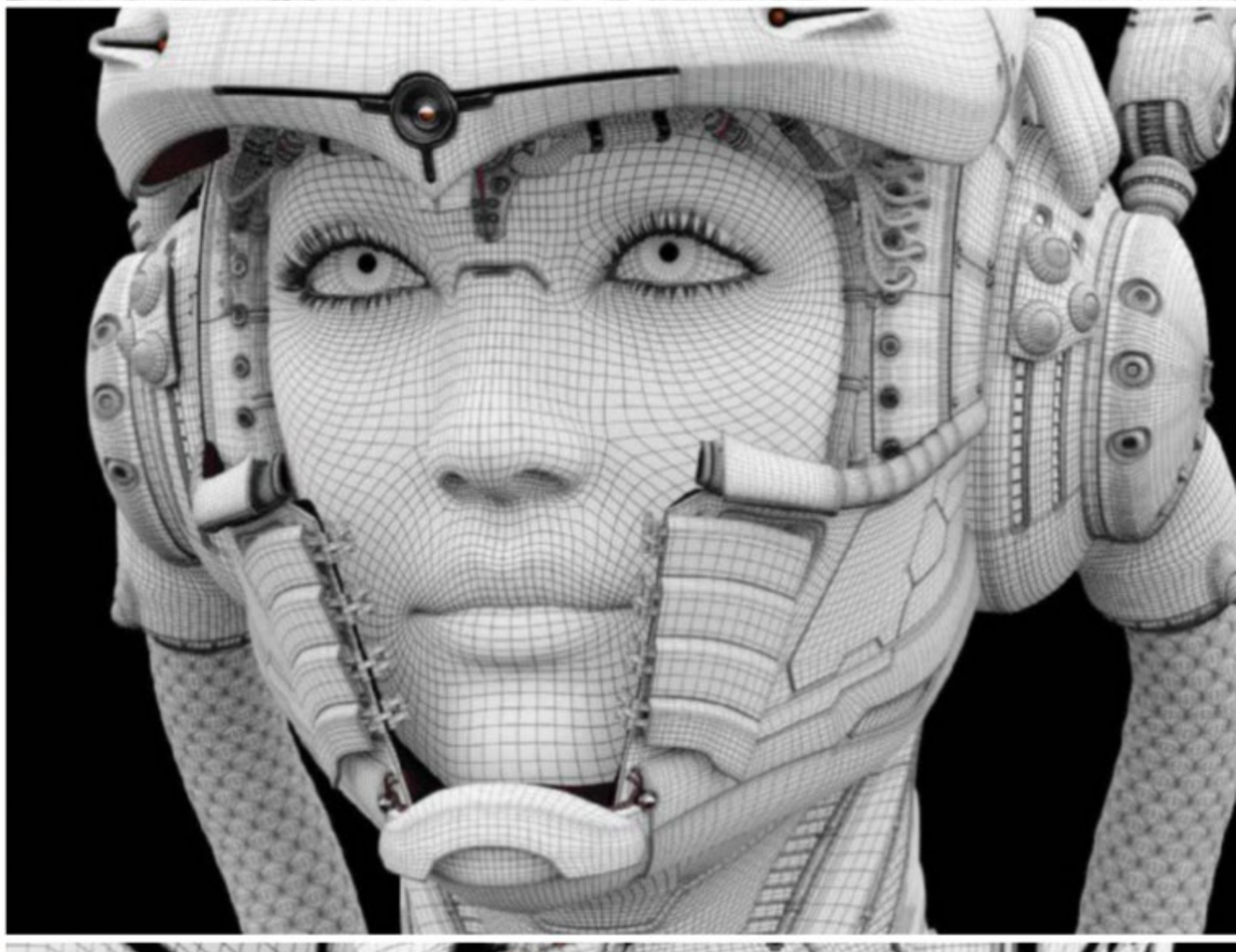
04 Build the brain I brought a large hemisphere shape to block in the outer shell. It was then converted by using a P2N script. Create additional polygon objects to make the trim line on the outer shell, placing the objects so that they intersect on the hemisphere. Generate the inward trim line with Circular Fillet, turning the Create Curve On Surface option on, then trimming it. Next, rebuild these surfaces and convert them back to polygon, merging them to prepare for UV texturing. For the numerous small mechanical supporting parts, it is a good idea to modulate some of them instead of making every single one unique. It's worth using the Hypergraph hierarchy in your workflow to organise them. Furthermore, as there are moving parts within the model that need to be shown in reel, key these in Maya to check that the mechanical movement seems aesthetically pleasing.

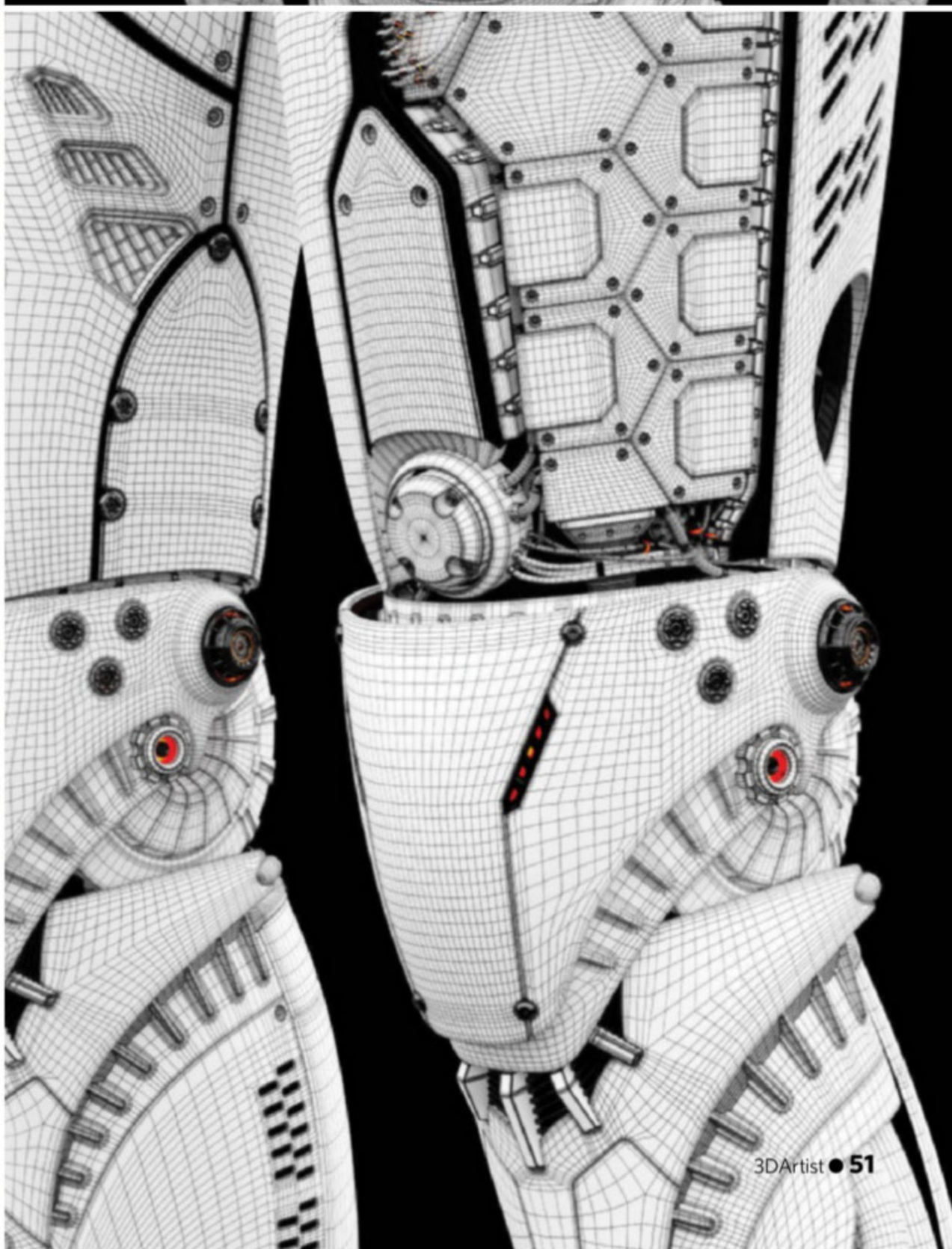


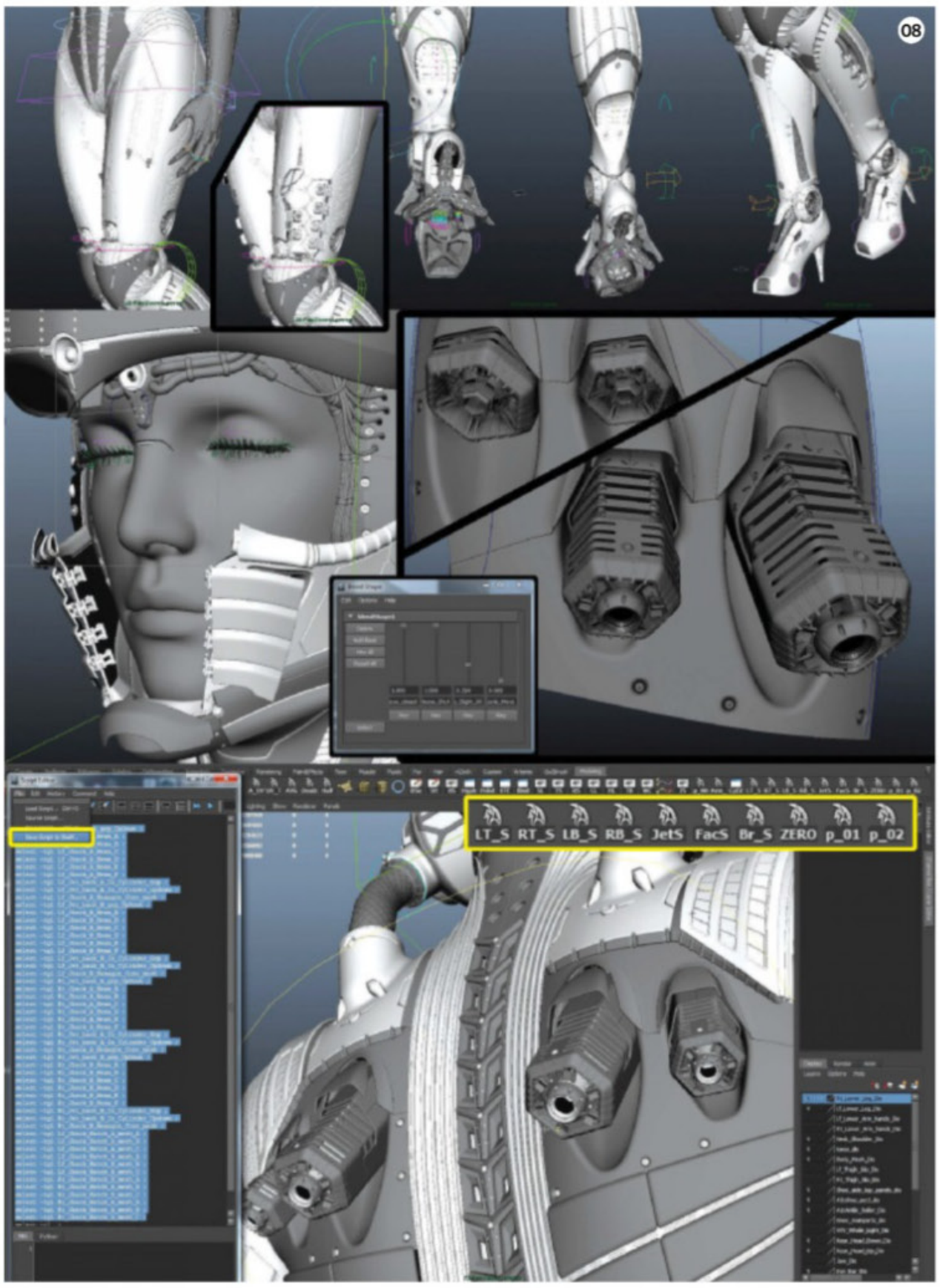


07 Add the heels Block in the high heels and convert to NURBS. Carefully chop where parts are divided and reassemble these parts when all the trims are applied and minor details are defined. Even once it's converted back to polygons, perfect specular will still be there. The inner booster is attached into the shoe's frame with thick wires and smaller cables behind. Rig all these wires with skeleton joints and fixed weights by using the Component Editor.







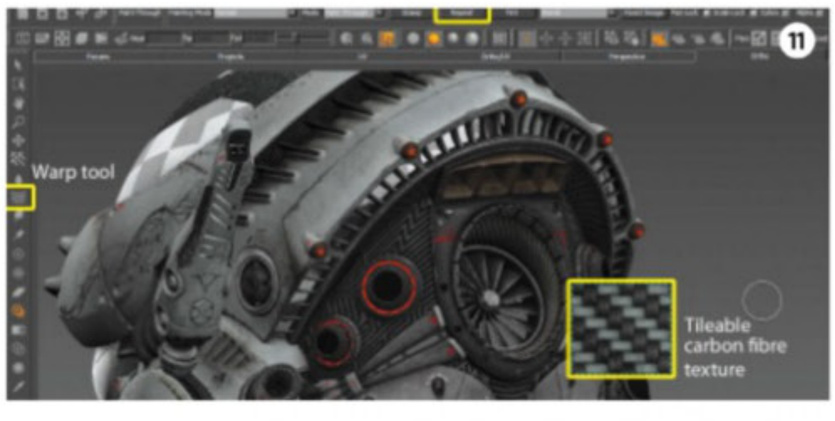


08 Finalise the mechanical parts Now spend plenty of time polishing the moving parts in terms of their movements and orders. A majority of them are keyed directly on the objects and have limitations in the Attribute Editor. Use set-driven keys and Connection Editors to make the movements interact. Once happy with the movements, open MEL and save them to make them easier to access later.

09 Create UV maps There are many ways to avoid the UV process, such as using Ptex or KeyShot materials and so on. However, we still need to go through this process because having UVs and applying unique textures enables us to achieve a better result. For many hard-surface objects that have circular objects in them, it's easy to get crooked UVs. If you use Maya, this is where the customised UV script comes in handy. I used this feature heavily because it gave me straight, evenly divided UVs from circular objects with a single click. Make a large UV area for her eyelids when her eyes are closed to avoid textures stretching when she blinks.

Use customised hotkeys

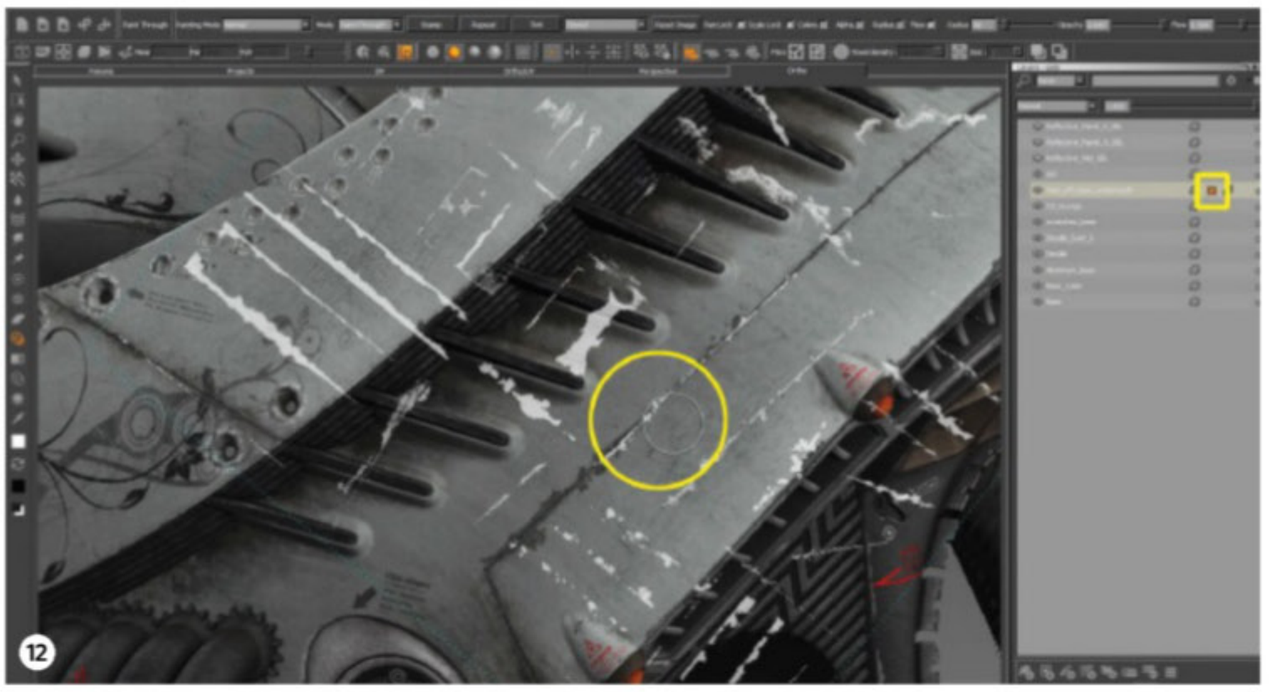
I simply cannot work without taking advantage of using hotkeys and marking menus. I customised all of my hotkeys in Maya so that I would be able to access shortcuts to the actions that I frequently used. I used combinations, such as Opt/Alt+ letters or Opt/Alt+Cmd/Ctrl+ letters or numbers. One feature that I use a lot is UV Texture Editor, or SelectUVShell. It comes in handy not only for UV edits, but also for making face or edge selections in the Viewport. Another personal favourite is the Display/Transform Display/Local Rotation Axes feature. When you have centre-pivoted one object, this will help you quickly snap the other object right onto its pivot.



10 Select a colour scheme This is one of the most interesting parts in the process of creating 3D models, as colour choice can make a huge difference. In *Artemis*, I avoided using primary colours to apply to large areas and only chose them in comparably small areas for tiny accents. As well as this, I intentionally avoided using purple colours that had a warm tone, preferring to use cool-purple shades. Purple looks harmonious with grey tones, which are included in metallic or chrome objects. Further to this, I added a hint of mint colours on the armour to create a gentle contrast with purple. Much more-vivid greens were used on environmental elements, such as HUDs, fog and laser beams surrounding her. This accentuated the overall composition, while complementary colours can be seen in the character.

11 Research materials We want her to look plausible in a scientific sense. Once we have a better understanding of the materials, the painting process will become much easier. For instance, carbon fibre can't be made out of procedural textures or simple projections from certain directions, as it's basically a woven sheet attached to a curved surface. Use the Warp tool in MARI to match the weaves to the curved surfaces. We should also add very thin stripes in an effort to re-create the look of brushed aluminium on some surfaces.

12 Paint in MARI I think MARI is a very powerful tool to explore. Start applying solid colours first to follow the predetermined colour scheme. Turn on Edge Mask mode and bring up highlight areas by applying slightly brighter colours on a separate layer. Next, apply a base material paint layer with varying layer modes, such as Overlay, Screen, or Soft Light. Oil grunges and grime layers can be painted with MARI's embedded Occlusion Calculation and masked as Inverted. Metal textures can be quickly tiled underneath, and peeled-off spots can be created by using the Layer Mask mode. Slight colour variations or adjustments can be easily created by using Layer Adjustment modes or stacks. Photoshop's ABR custom brush files can also be imported into MARI, if you have any custom brushes that you would prefer to use.



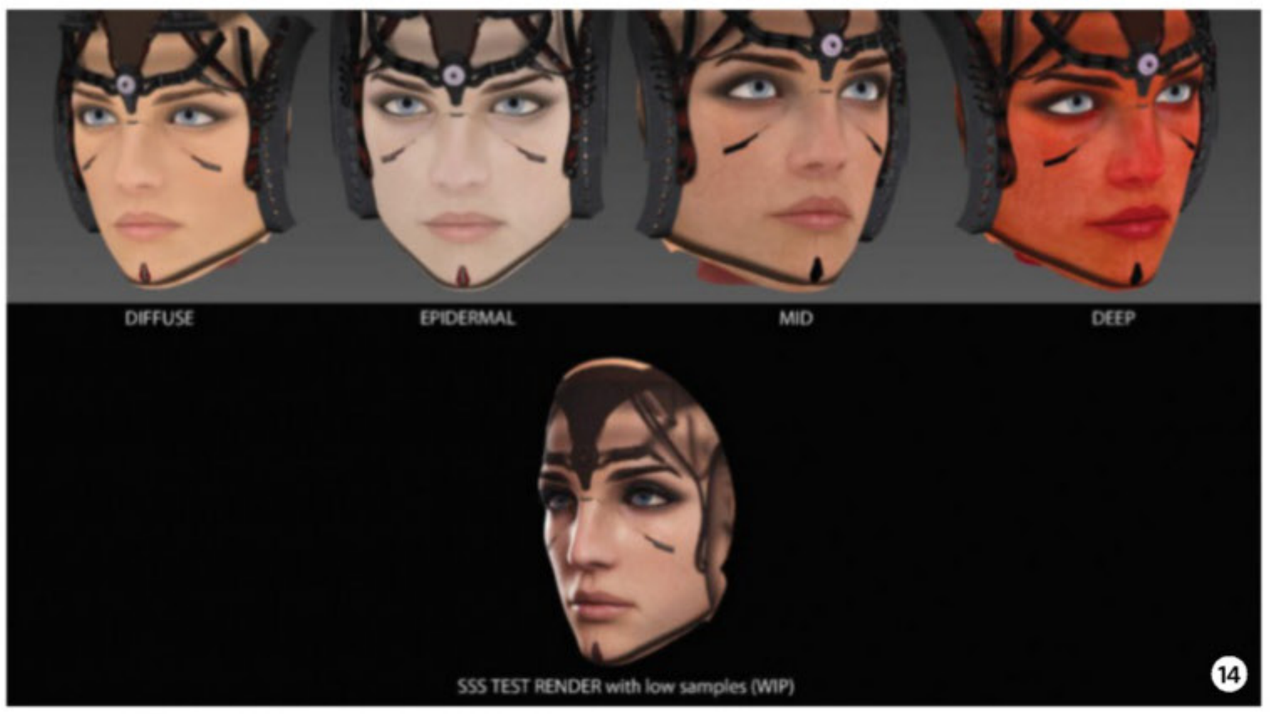
13 Use Alpha maps For painting the peeled-off metal look, have a go at making your own Alpha map by tweaking photo references. We can also make other Alpha maps for painting decals on metal parts. In MARI, you can lock the scale or position of Alpha maps or texture maps in the Viewport. This function will provide you with more chances to create accurate paintings while enabling you to navigate the Viewport more freely.

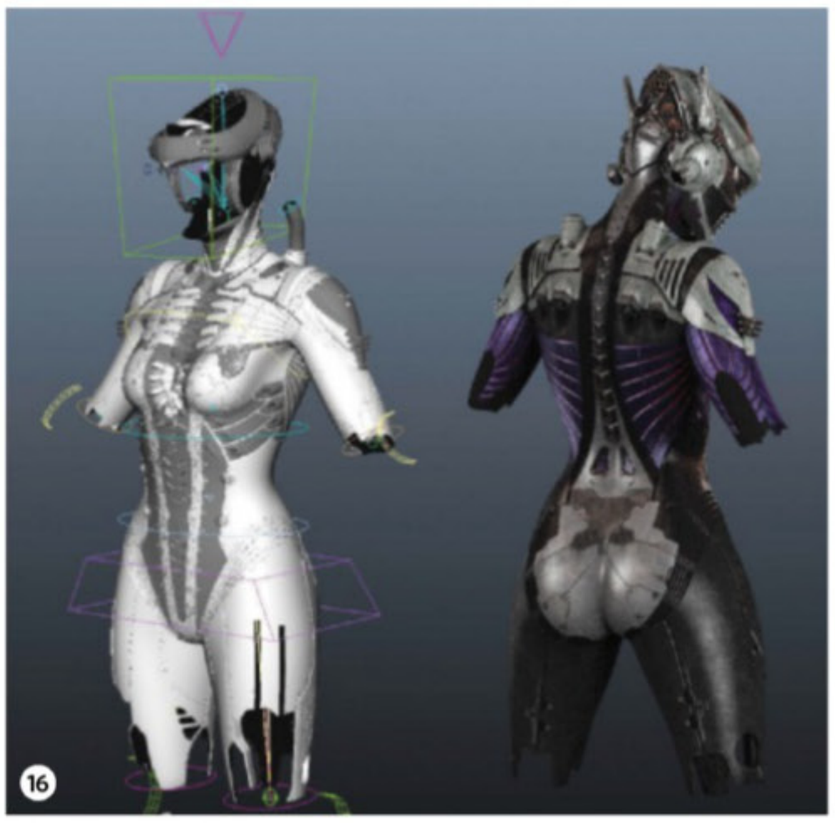
Collaborate with other artists

Personally, I was lucky enough to get to know Jason Kang, a talented motion-graphics artist. Our goal was to make two different versions of reels based on one character. Since he was using CINEMA 4D to work on his reel, I needed to hand over a completely cleaned Maya file and an Alembic export, which contained cached animation data in it. For some particular shots, we still needed to use the V-Ray renderer in Maya. The final composite was made in CINEMA 4D and After Effects by Jason.

14 Texture the face Texturing the skin of a young woman is challenging because of the subtleties of human skin. Start off by painting a Diffuse map, but make sure that you paint her make-up on a separate layer. Underneath this there's a bare skin layer that has skin details, such as blood veins, pores and other possible variations. You should have high-resolution source textures of female figures that are free of any highlights or shadows. The elimination of these areas can be conducted through the use of image-editing software like Photoshop. Keep in mind that the Epidermal layer looks pale because it is actually dead skin on the top surface. Try to distinguish out where the areas have more cool or warm tones. Even when you are painting the Subdermal layer or the Deep Skin layer, you may still need to keep an eye on which parts need to have cooler or warmer tones. This is an important aspect in making the model's completed face appear correct in the finished render.

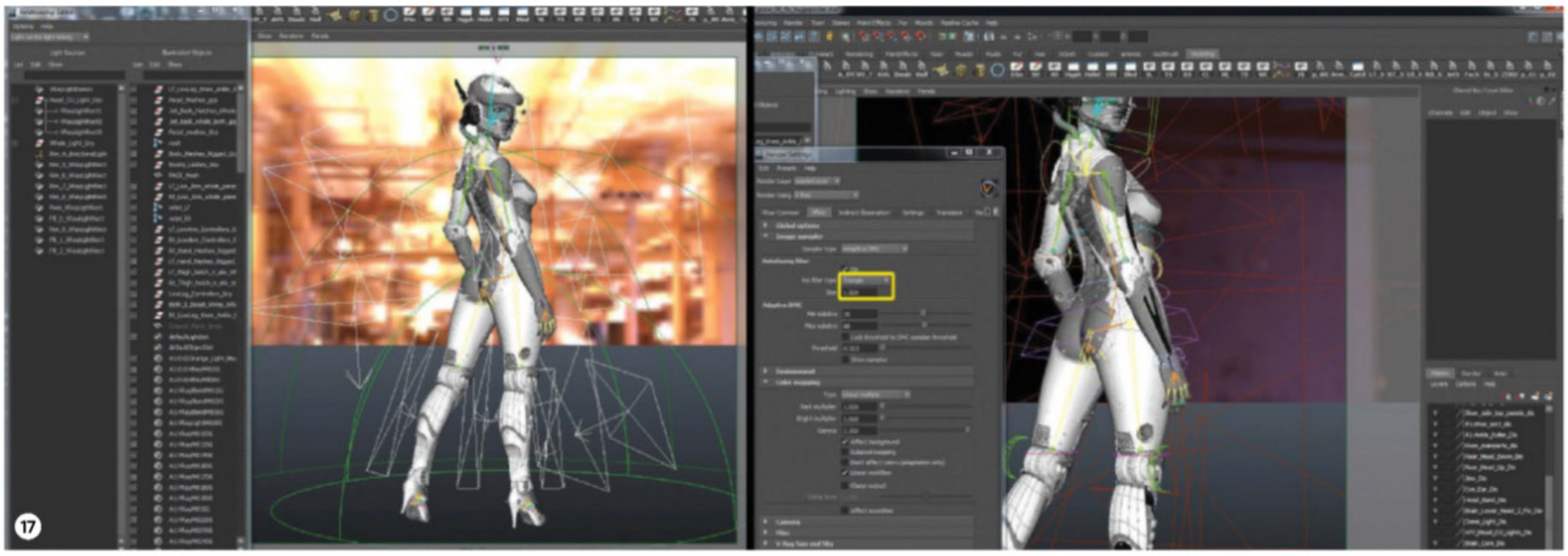
15 Generate maps from the Diffuse map In my workflow, I usually don't paint Specular or Bump maps in MARI. Instead, I generate them in Photoshop by editing the Diffuse map. Since she has many metallic parts, let's try to add a little bit of colour on the Specular map and look for its proper variation. Quixel Suite's NDO is an excellent tool to generate Normal maps and there are many preset options you can explore. Often I find the preset options that come with the software are a decent start point. When creating *Artemis*, I often used the Sharp Brick preset.





16 Rig and pose Even though the design of the suit is complex and intricate, the basic overall shape of the character is bipedal. As such, I had the advantage to reuse an old rig of mine from another character that I created before. I didn't fix every weight around her torso – only a few adjustments were necessary to create her final pose. I imagined that some slight movements, such as weight-shifting animation during a turntable rotation, would make my modelling demo reel look more interesting.

17 Work on lighting and rendering For this scene, it's worth using multiple V-Ray Rectangular lights. Ensure that the tip of the lights have smooth borders by connecting the Ramp node. Disconnect some of them from certain parts of the character in the Light Linking Editor to enhance the lighting. HDR images can be applied on a V-Ray Dome light. If you want to achieve certain kinds of reflections, it is worth tweaking the HDRs in Photoshop to enable this. Next, in V-Ray choose Brute Force as the Primary Bounce, since detailed textures have been heavily applied. Light Cache can be used as the Second Bounce. Once we have rendered her face, we should also use Irradiance-mapping and render a separate SSS pass as well. In my project I used the Adaptive DMC sampler with a Triangle sampler set to between 1 and 1.5. Render out separate render passes with the 32-bit Open EXR image format with Physical Camera DOF turned on. V-Ray is a good choice to render this project, but I recently had a glimpse of a new renderer called Redshift, which showed impressively fast performance.



18 Composite and retouch

Compositing render passes enables us to solve the lack of brightness from the raw rendered image – for instance, overlaying Light passes on top of the Diffuse or Beauty pass and switching the layer mode. Create several layer masks on all render passes and do a black-and-white painting job on this, as there are some areas that need to be particularly lit up or dimmed. The same technique is applied on sharpening or noise. Even if it's about minor details, some areas need to be sharpened, while other areas must be blurred. It's both interesting and fun to make changes, as you can see improvements straight away when compositing.

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Step by step

Easy-to-follow guides take you from concept to the final render

Thomas Lishman

3DArtistonline

Username: tlishman

Personal portfolio site www.tlishman.co.uk

Country United Kingdom

Software used ZBrush

Expertise Digital sculptor who specialises in working for the toy and miniature industries

Sculpt for 3D printing

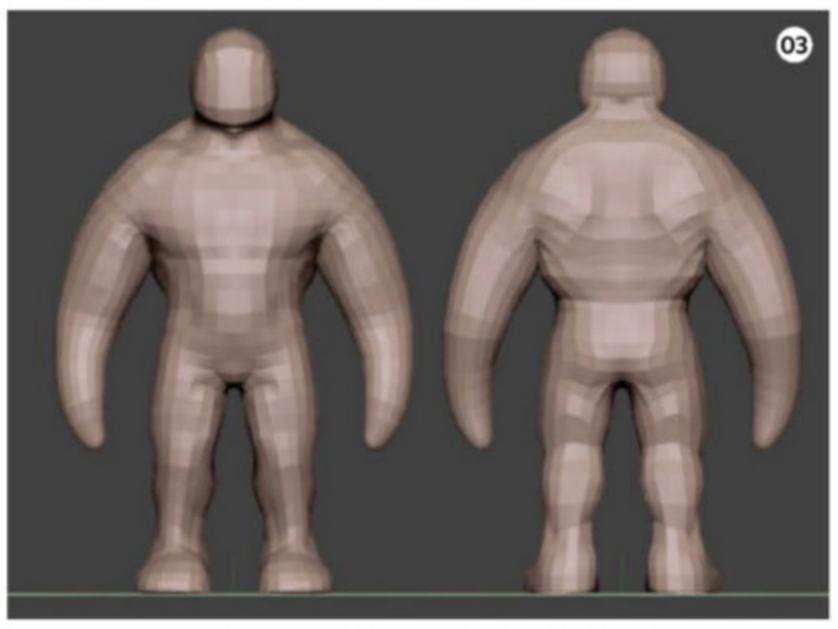
The Grubby Chef 2014

> This character was created from ideas of chefs at grubby diners and what a fantastical and alien creature version would look like

Thomas Lishman works as a freelance artist. He specialises in digital prototype figure sculpture using ZBrush

The figure and toy industry has been rapidly changing due to the increase in digital application and 3D printing. With its vast range of digital-sculpting tools, ZBrush has taken centre stage as one of the key programs in the 3D-printing movement.

The following steps will help you learn the various methods digital sculptors use to sculpt for printing in mind. They will introduce sculpting from a simple base to a final, split, print-ready figure with full detail for both printing and even further production.



01 Start out We are going to use ZSpheres to begin our figure, but first we need to set up our reference. Open your reference in your preferred image viewer, then drag it behind the ZBrush window. We will be using the See-Through tool in ZBrush to see our reference, which is located in the top-right corner. Adjust it so you can just about see your image.

02 Add ZSpheres Open DynaWax64 in the Lightbox Project palette, then in the right-hand tool menu click the slider and type 46 to select ZSphere. Enable Symmetry with the X key, and use Q, W, E and R to enable the Draw, Move, Scale and Rotate tools respectively. Start by building the basic structure using the reference as a guide.

Make use of reference

I use two monitors for my sculpting process. I open two copies of the reference image – one for my second screen and the other for under my ZBrush window. If you do not have an additional monitor, I highly recommend getting hold of one! If you are using reference, be sure to turn ZBrush Perspective off. This can warp your model, making reference usage inaccurate.

03 Sculpt the mesh In the Tools palette, scroll down to Adaptive Skin and click Create Adaptive Skin. This will create a new tool. Select this tool and enable Symmetry (X). Delete the lower subdivisions and change the ZRemesh Polygon Target to 1 and hit ZRemesh. Now let's grab the Move tool and adjust the mesh to roughly match our reference. ZRemesh again once you are happy – you want to make the most out of every polygon.

Learn how to

- ☑ Create a full character quickly and efficiently
- ☑ Sculpt for 3D printing
- ☑ Split and break up your character for printing
- ☑ Understand the essential printing requirements

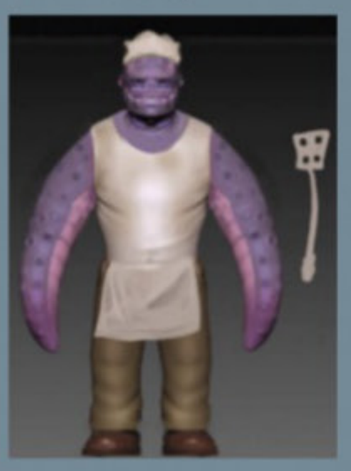
With the Disc

Tutorial files:

- Scene files
- Tutorial screenshots

Concept

I start with either a loose sculpt or a concept sketch. In this case I made a very basic model and sketched over it in Photoshop.



04 Begin sculpting

Let's subdivide and start sculpting on our base mesh. We will primarily use the ClayBuildup and Move brushes. Subdivide once and refine your previous forms, smoothing and using external reference for muscle groups where needed. Make sure to push your model as far as you can before subdividing again.

05 Extract clothing

We'll start by masking off the vest and then we'll extract using a low number, such as 0.01, then increase or decrease until you have your desired thickness. Cmd/Ctrl-click the inside, delete it, then close the holes using the button in the Geometry palette. Do the same for the shoes and trousers. On your new SubTools, remember to enable Symmetry and smooth out the edges in preparation for sculpting.

06 Sculpt clothes

To start sculpting the clothes, first find some good reference, even if that means standing in front of the mirror! Sculpt using either ClayBuildup or Standard brushes and emphasise size and depth for each crease. We want to scale up real-life creases so they show better in print. For the shoes, mask areas and then inflate or sculpt, being sure to make the details bold and oversized.

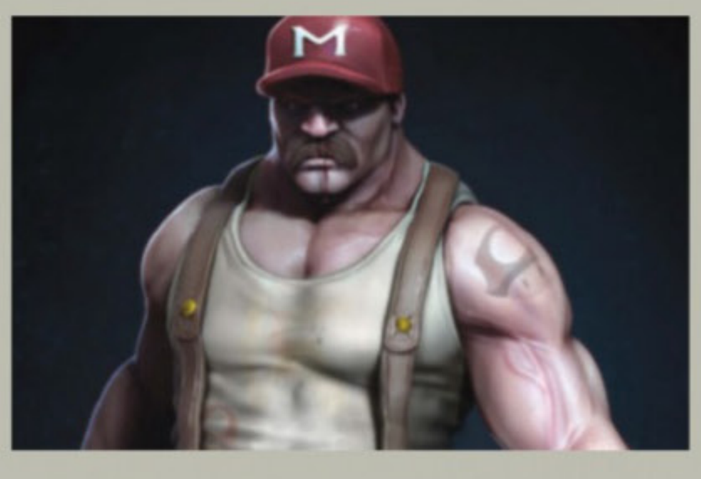
07 Sculpt the head

To start sculpting the head, let's break it off from the body. Freeze subdivisions and use the Select tool to hide the head, then in the SubTool palette hit Split Hidden. Close the holes on both head and body SubTools then unfreeze the subdivisions. On the head, DynaMesh it and start sculpting out the finer details. Use a Sphere Insert mesh for the eyes, split them to a separate SubTool and extract the eyelids, then merge and DynaMesh the eyelids to the head. Remember to push all your details deeper than normal to really emphasise shapes.

Artist showcase

Thomas Lishman

As a freelance digital sculptor, Thomas has been working in the toy and miniature industry for the past two years. He has worked with a number of prolific companies such as McFarlane Toys, NECA and Cool Mini Or Not. He has also sculpted figures that are currently sold world-wide from big-name licences such as Marvel, DC and Ubisoft.



Bruiser **ZBrush, Photoshop (2013)**
Created for a competition, the subject was to reimagine videogame characters. It ended up being a great learning process and developed into this character!

Dino Speedsculpt **ZBrush, Photoshop (2013)**
This was a speed sculpt created in 45 minutes based on the theme 'Naughty Dinosaur'. I didn't quite hit the mark, but I learnt a lot and managed faster sculpting workflows.

08

08 Sculpt the arms We want to go for a very organic, squid-like feel for the arms. You can either use an Alpha for the details or sculpt them by hand. Alphas are quicker, but I prefer a hand-sculpted result. Use the Dam Standard brush to create the creases and ClayBuildup for the main forms. Nice, big details will look great in print.

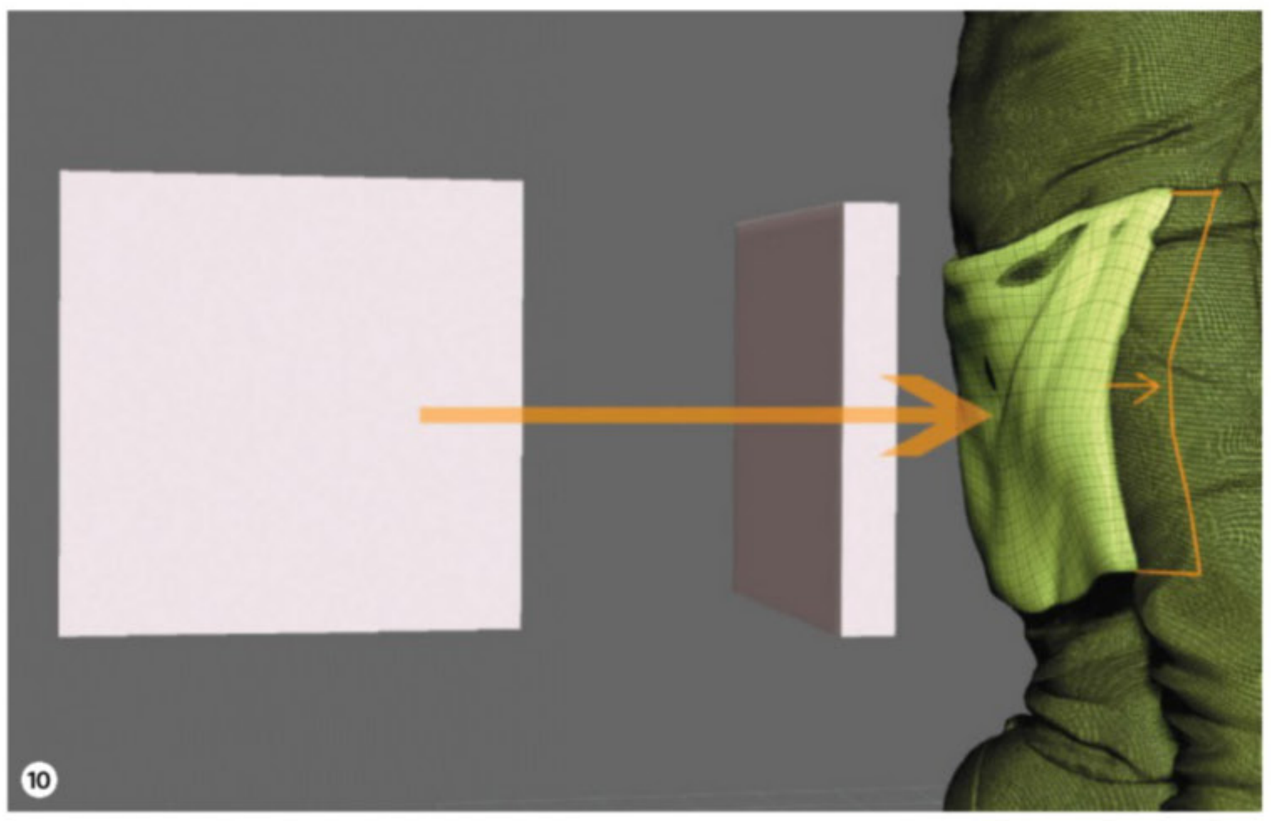
09 Sculpt accessories: spatula For the spatula, append a cube and hit ShadowBox. Mask out the general shape of the spatula head, including the holes. Then append a cylinder, scale it for the handle and extract the grip. Make sure to at least double its size and thickness for print.

09

Big changes

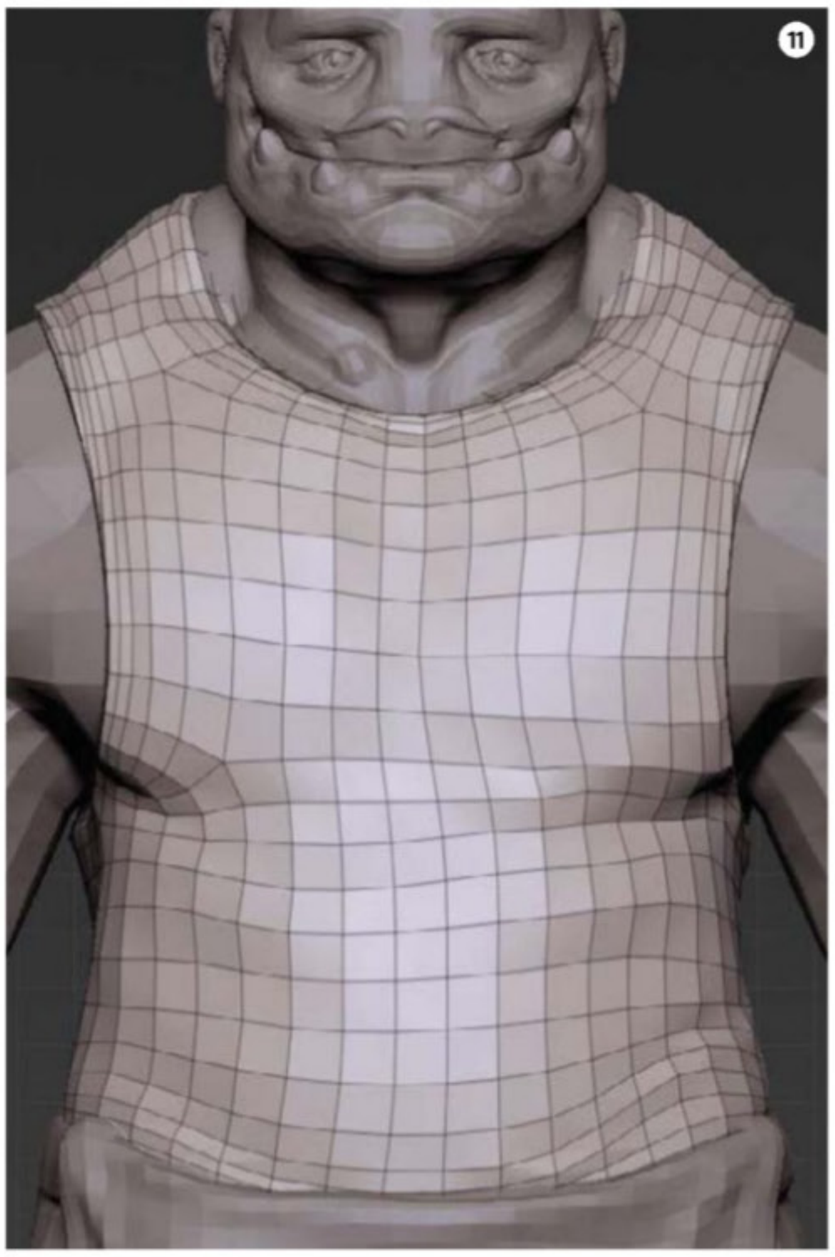
Not every model will be perfect the first time around, and many artists make lots of mistakes! A good practice to get into is ZRemeshing low and using subdivisions. Then, if you need to change the overall shape or make massive adjustments, all you need to do is take it down to a low level and it will preserve your details.

Mauller **ZBrush, Photoshop (2013)**
A fan-art sculpt to study game-creature asset workflow, this guy was fantastic fun to sculpt, and I was really happy with the final result. I rendered him in ZBrush and Photoshop.



10

10 Work on the hat and apron For the hat, append a sphere and scale it down, positioning it around the head. Just use ClayBuildup and DynaMesh with Polish enabled to sculpt out the hat. For the apron, append a cube and use the Transpose tools to scale and position it. Flatten one side by scaling it down one axis. DynaMesh this and then start sculpting folds by using ClayBuildup and Standard brushes. Ensure that the thickness is similar, if not thicker, than the spatula. Drag the mesh into the leg so that there are no unnecessary gaps that could cause print errors.



11 Prepare the mesh for posing Before we pose, we need to make sure each SubTool has subdivision levels that are low enough to pose. ZRemesher is our key tool in this step. The process here is to duplicate the SubTool you will remesh, then use the ZRemesh Guide tool to loop areas such as joints (if a part is a-symmetrical, disable Symmetry). After this, ZRemesh the SubTool to a low level (between 1-5k) and subdivide the result. In the SubTool palette, project the details from your duplicate back on.

12 Adjust the pose Using reference for your pose is essential for a great-looking piece. Find one with good flow and curves. In this case, I merged one or two different poses, but you can use whatever you want. We are going to be working with the Transpose Master plug-in. Hit T-pose and once it has finished computing, hide the apron and spatula so that these are no longer in your way while you're working.

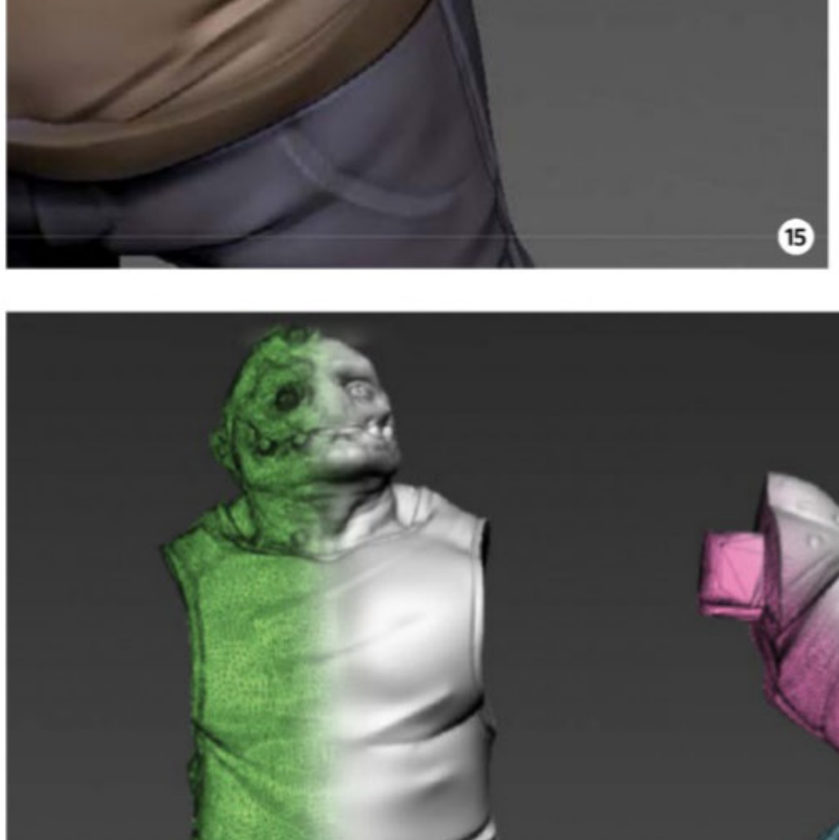
13 Refine the character's shape Focus on creating a pose with good stance and flow. Remember that this figure will need to stand on a flat surface, so be sure to make it balanced. Use Cmd/Ctrl-click and drag on the limbs with the Transpose tool to quickly mask off areas, and then once again Cmd/Ctrl-click to soften the masks. Once the body is posed, reveal the accessories and adjust them so that they're in place.

3D printing

3D printing is on the rise, but preparing your 3D model is essential to getting the most out of every print, no matter the printing quality. Deep details and bold features are key to providing a successful print that works well, even with budget printing.

14

14 Break it down We will want to split the arms, hat and spatula into separate parts. First, take the trousers, shoes, apron and head and merge them together. For the creature's body, delete any areas that won't be seen so you are left with the arms. Duplicate the merged clothes and hit the Subtract button on the SubTool in the palette and merge it with the arms. Hit DynaMesh and this will cut away from the arms, leaving the arms with smooth, flat areas for sockets.



15

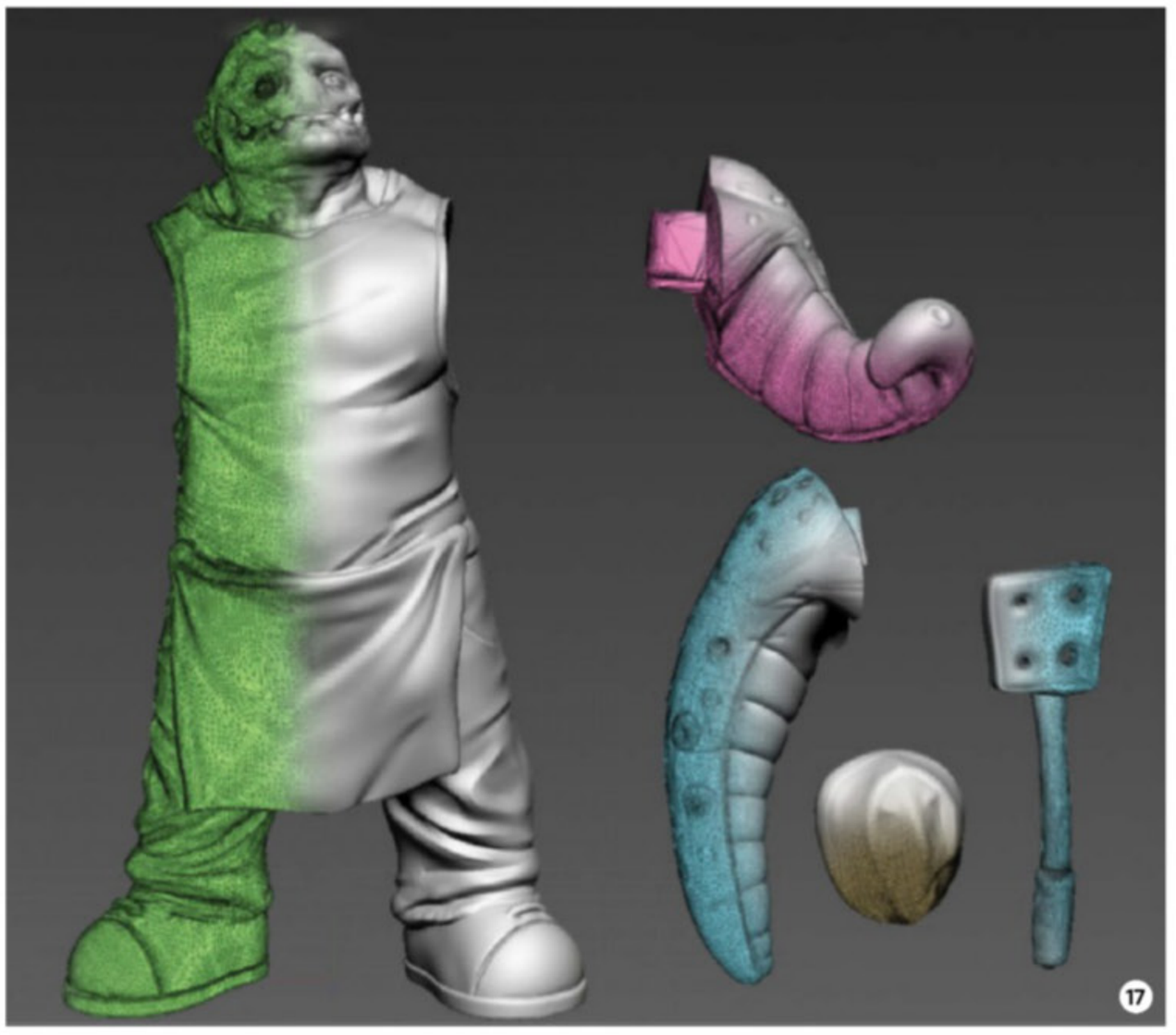
Use scale reference

Depending on what material you plan to print with, each will have their own requirements. A common requirement is thickness no smaller than 0.3mm. To help when sculpting, use Maya or 3ds Max and create cubes to scale for each requirement. You can then append these as SubTools and use them to help make sure the details will show up.

15 Make the sockets DynaMesh the body with the head, but remember to uncheck Blur to reduce information loss. For the arms, append cubes for the insertion part of the socket. DynaMesh it, then duplicate it. Enable Subtract and merge with the body and DynaMesh it to create the holes. Smooth out the inserts on the arms so construction is easier.

16

16 Add the accessories Duplicate your spatula and use the Subtract technique to create a hole in the holding arm. Smooth the hole a bit to enable insertion after it's printed. For the hat, just Subtract the head from the hat to leave a smooth area that can be glued on. You may need to increase the hat size and thicken the edges for print.



17

17 Decimate the model You should now have five separate SubTools. Decimate each one so that it's under 300k polys and hit Close Holes In The Geometry. Arrange each part separately, then merge them all together, but as separate groups. Depending on the make of the printer or the printing method required, the machine may request single objects at a time. To work around this, attach a sprue made from a simple elongated cube and extruded branches to attach the figure parts.

• **DID YOU KNOW?** • All tutorial files can also be downloaded from: **www.3dartistonline.com/files**

Pulldownit 3

destruction plugin

www.pulldownit.com

THINKINETIC

IMAGE BY IVÁN DE FRÍAS

Technique focus

Incredible 3D artists take us behind their artwork

TEXTURES All the textures were hand-painted as I wanted to give my image a stylised look, yet also maintain a certain amount of photorealism. The goal was to direct the eye to different points of interest without being overwhelming. This is why I gave the textures a de-saturated look, while maintaining a more-saturated colour relationship between key elements. **Mechanical Rebirth,** 2014

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Username: Kingpoby

Website
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Country Canada

Software used 3ds Max, V-Ray, Photoshop

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Step by step

Easy-to-follow guides take you from concept to the final render

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Website www.behance.net/MikeJagodzinski

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Software used MODO, MARI, Quixel Suite, V-Ray

Expertise Mike is a 3D generalist who specialises in hard-surface assets

Anselm von Seherr-Thoss

Website www.vimeo.com/anselmvonseherr

Country USA

Software used 3ds Max, FumeFX, Pflow, V-Ray

Expertise Anselm is a VFX technical director specialising in particle-based effects

Launch a space shuttle

Space Shuttle 2014

"Use MARI, MODO and V-Ray to re-create the famous Space Shuttle and simulate fire and smoke from the craft's thrusters"

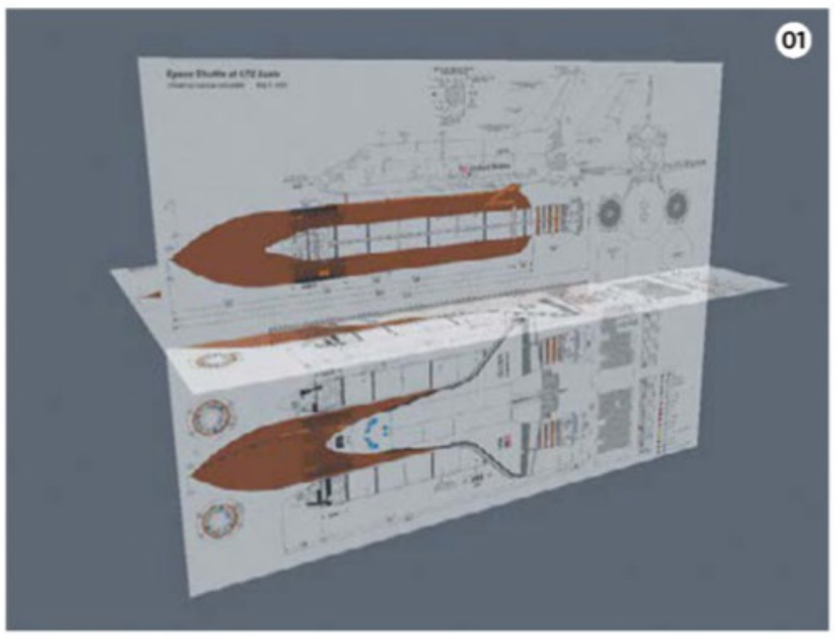
Mike Jagodzinski freelance 3D generalist, USA

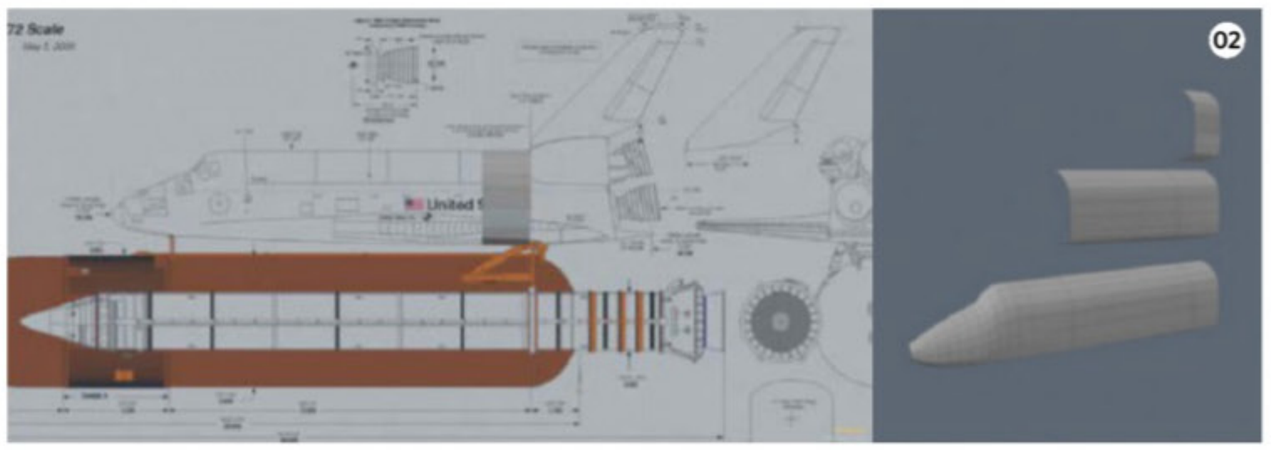
Anselm von Seherr-Thoss co-owner and VFX artist at Incendii LLC Visual Effects, USA

Over the course of this tutorial we will cover how to create the iconic Space Shuttle using MODO 801. As well as going over UV mapping, we will import the base model into the robust texturing program, MARI. We will also learn how to deal with using several UDIMs within MARI and MODO. After surfacing is complete, we'll be rendering with the V-Ray for MODO plug-in, then comp the still image using Photoshop.

As for the simulation, here's a little bit of background. It was originally designed for *COSMOS: A Spacetime Odyssey* for a simulated volcano eruption. This setup was then modified and stripped to double up as a large rocket-thruster engine. You will notice that we will simulate the engines upside down and then turn them 180 degrees. The effect really isn't that dramatically different!

We are also going to use a very simple Pflow setup to emit particles quickly, and with a short lifespan. This will drive a FumeFX simulation to push out fuel and smoke. The speed of the particles will cause a nice rolling and plumes of the smoke. We are also only going to simulate a single thruster, then duplicate, scale and offset that one simulation to double as many render elements and layers.





Start simple

When you are modelling it's quite easy to become overwhelmed with the complexity of the asset that you're working on. Always remember that you should start simple. Whatever it is, you should always be able to start with a simple primitive or a simple polygon and just build the shape from there, little by little. This will enable you to end up with a complex model without having to stress out over the model as a single entity.

01 Know your asset The first thing we really need to do is get the basic information on the asset we're going to build. It can be anything, from concept art to images found on the internet. In this case, we can even get size information since it's a real-life model – always work in real-life scale. After we have all of our information together, it's time to start modelling.

02 Start modelling To begin the modelling process, we need to decide where to start. The main central fuselage of the shuttle is a good idea. As this is a simple shape, it will be something we can build upon. Start with a Cylinder primitive and delete half of it. From creating this, we need to begin defining the shape. To do this we can extend the edges with the Z key as needed, as well as move the verts. Always complete one area before you move to the next.

03 Complete the model Once we've finished with the main fuselage, it's time to add the wings and tail. For these, simply start with a basic Polygon cylinder, then extend and add edges as necessary, as well as adjusting the verts like we did in the first couple of steps. Keep using the reference views to ensure that the shape is correct. Since the main fuselage of the shuttle is complete, we can mirror this completed side onto the other side. Once this is done, the shuttle is about complete, and it's time to use the previous steps to build the rest of the shuttle parts, so add the major details like the main hatches, windows and so on.

With the Disc

Tutorial files:

- Scene files
- Tutorial screenshots

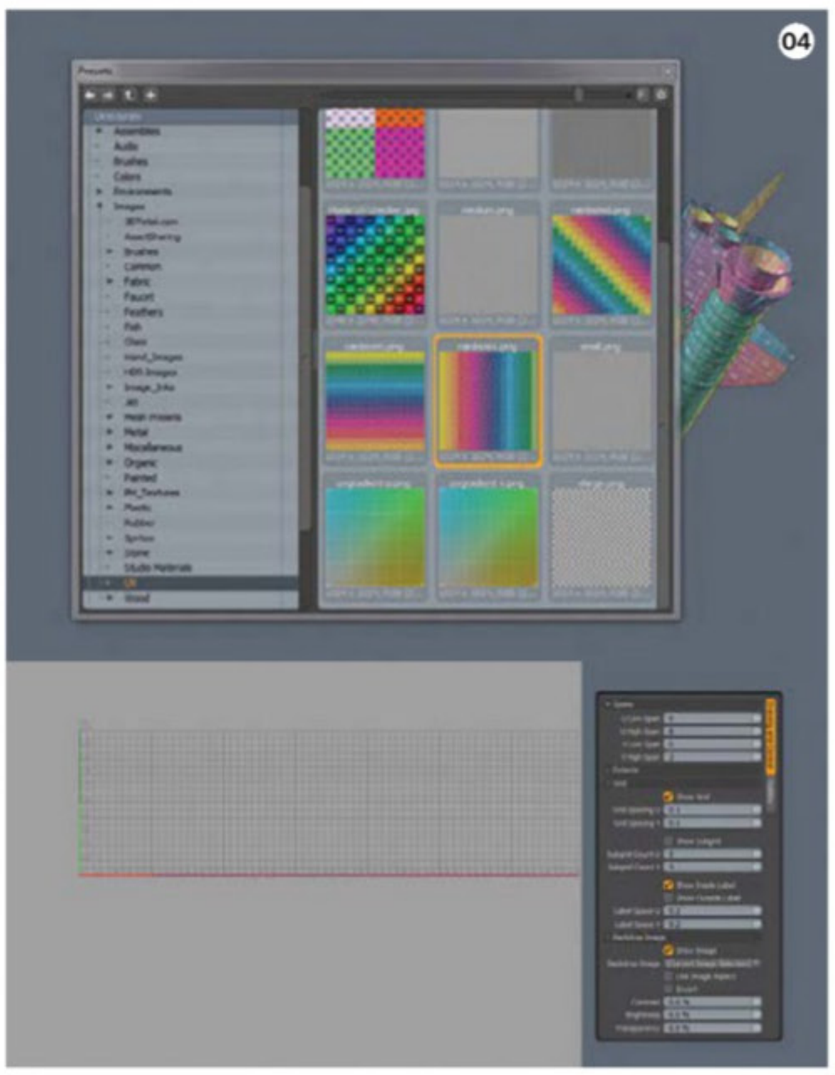
Learn how to

- ☑ Model a high-poly Space Shuttle in MODO
- ☑ Create UV maps and textures within MARI
- ☑ Render with V-Ray for MODO
- ☑ Use Particle Flow to drive a FumeFX simulation
- ☑ Simulate big rocket thrusters for print resolution
- ☑ Duplicate FumeFX grids after simulation
- ☑ Shade and render

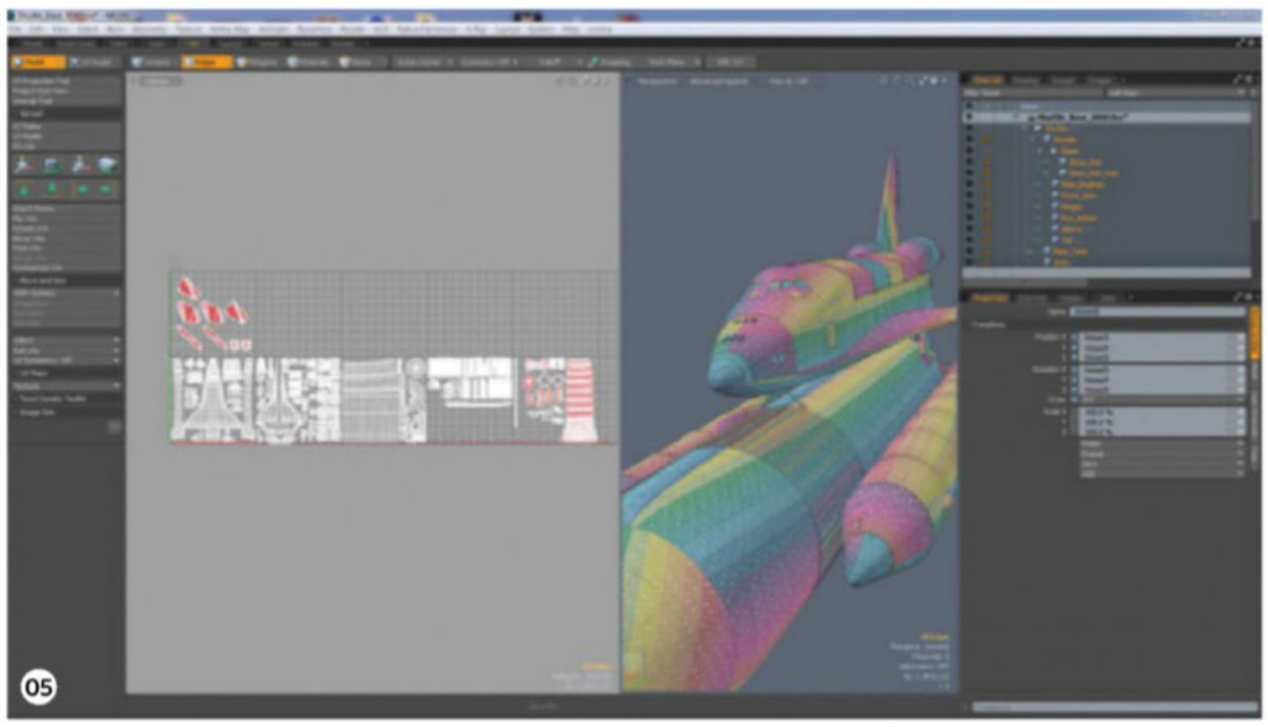
Concept

The idea here is to emit a lot of fire and smoke in a really short amount of time. If you look at reference from a real shuttle, you see huge thruster flames and a lot of smoke emitting from the burnt fuel. The smoke is pushed in all directions, colliding with the ground and other obstacles.

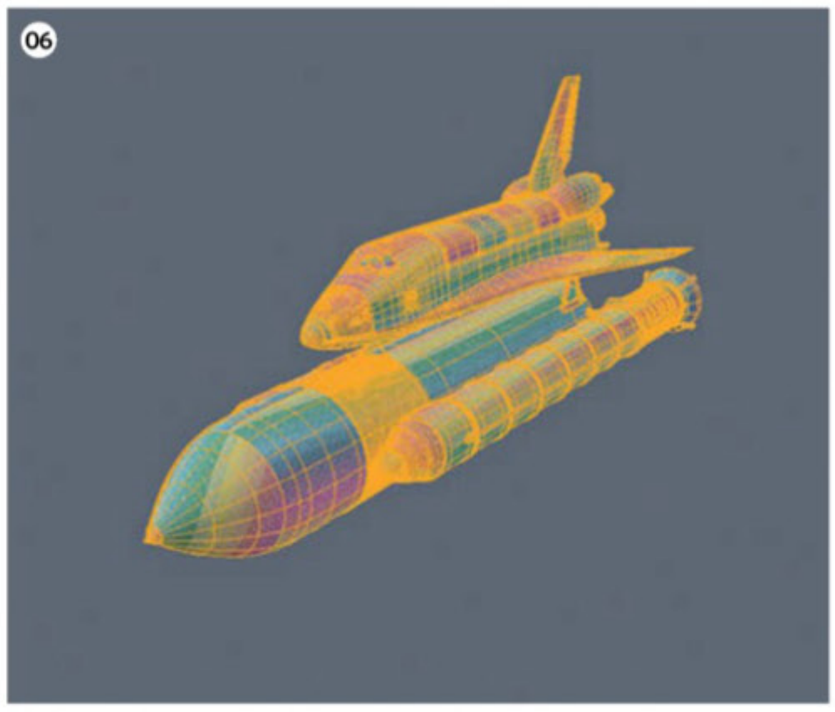
04 Start UV mapping Since we have all the parts modelled, it's time to get on with UV mapping. First of all, let's consider our texturing needs. This is going to be a pretty close-up still shot with quite a large final render size. With this in mind, we'll use several maps – somewhere around 4k for each map, with perhaps six separate maps. As we're going to use MARI to create our textures, if we need to downsize them later it won't be an issue. Let's head into the Assets folder and pick a UV mapping image to use. Once we've found an image, drag and drop this into the Shader Tree. We also need to do one more thing to get ready – press the O key to bring up the UV Screen Editor options. We also need to adjust the UV High Spans to around 8 on the U, and 2 on the V.



05 Complete the mapping When UV mapping, it's usually better to start with the larger pieces then move on to smaller items as we continue. From here we're going to start with the main shuttle itself and go into Edge mode. Start to select the edges with the body flow in mind. This will help to reduce the amount of stretching. After we have selected the main edges, click Unwrap and break the major pieces apart into separate sections. At this point, we need to focus on one section at a time to ensure that they are properly unwrapped.



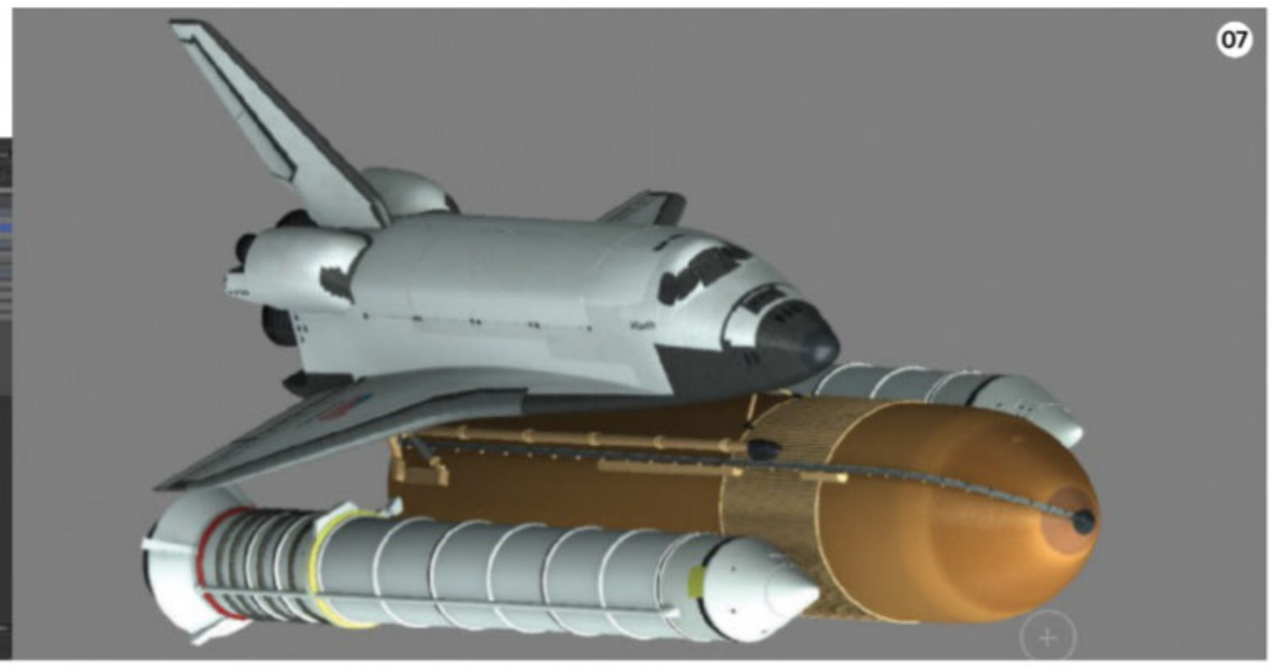
06 Export to MARI At this point, the UV mapping should be complete, so we need to move the geometry into MARI. We have two options with this – either as an OBJ or Alembic. Both work quite well, but in this tutorial I will export as an OBJ as I prefer that format to use. Before we export the model, any item that is a sub-divided will need to be frozen. Do this by selecting the item, clicking the Geometry tab and pressing Freeze. Keep in mind that the higher the Sub D value, the more dense the mesh will be. After this is complete, go into Item mode and Ctrl/right-click on the items you want to export, pressing Export Selected Layers.

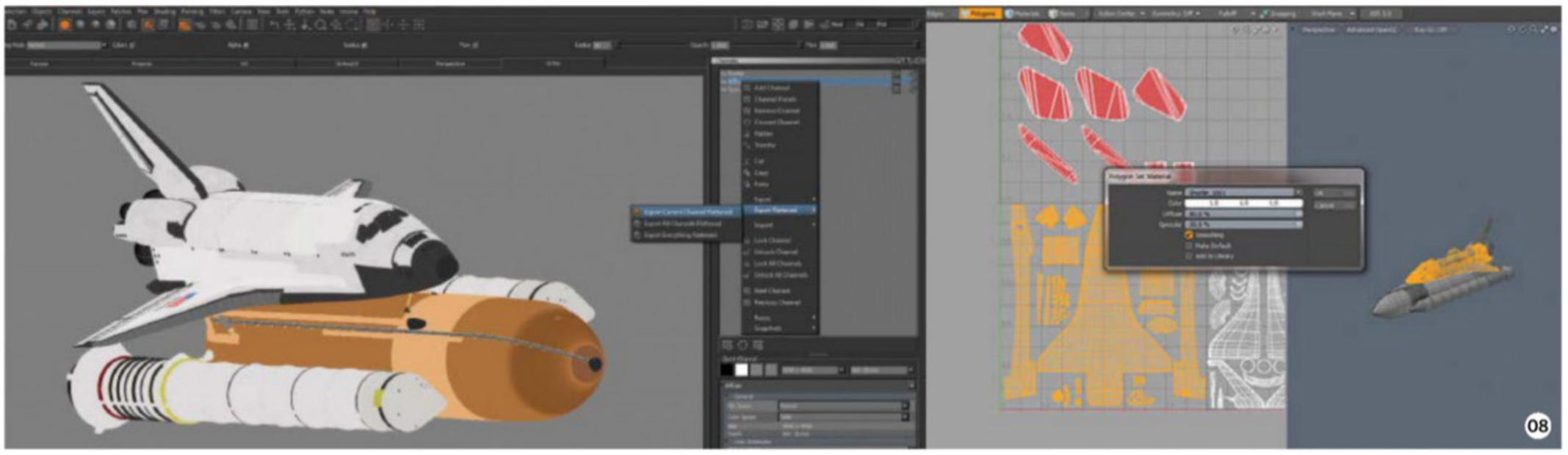


Use UDIMs

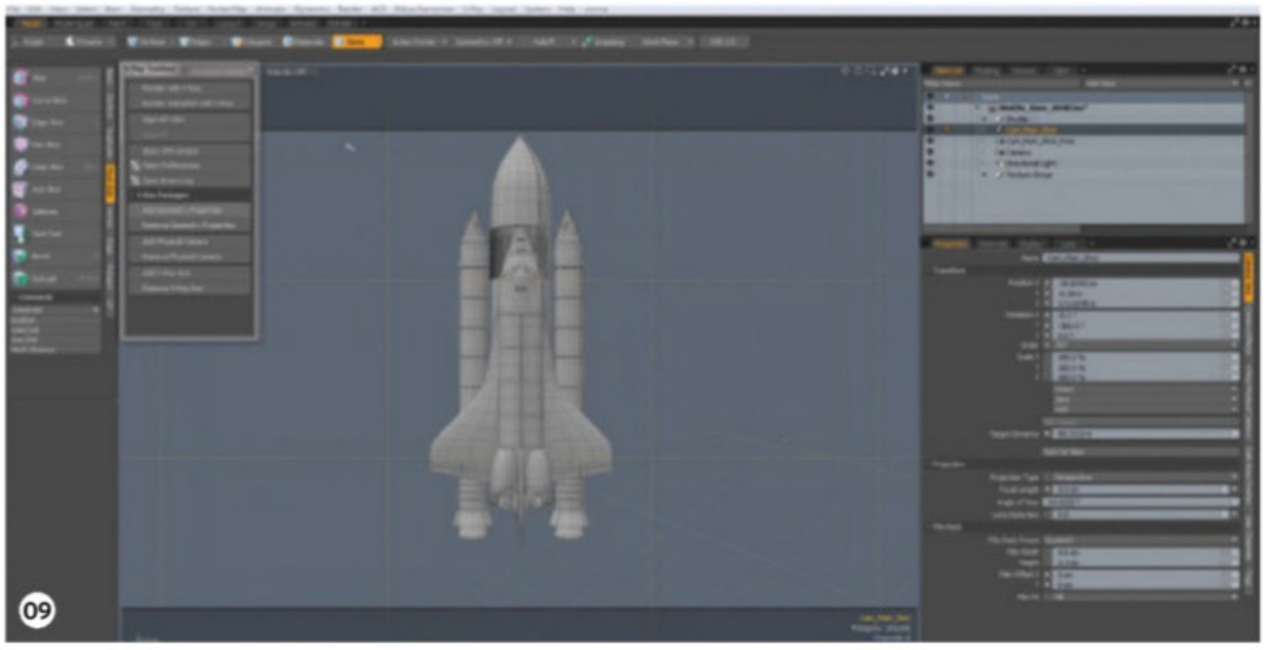
For those that may not have used UDIMs in the past, the key thing to remember is that it's an easy way to achieve incredible texturing detail without the pain, especially when using MARI. It means you can edit across several maps at the same time, as well as adjustments layers and so on. Using MODO, it's quite easy to import all of your UDIMs at once with a few simple clicks.

07 Texture in MARI Now we're ready to import the model and get started on the texturing. First of all, go to File>New, then add the necessary information, such as the name, where the Geo file is, as well as if you want it to create a base Color map or any additional maps. Unfortunately I can't thoroughly explain the texturing workflow, but as you can see from the final textures, I've used several image maps from GC Textures with the Paint Through tool, plus a few procedural ones within MARI. It's all about layering the textures to get the desired effects. We may find that it's good to throw in some colour variation so that everything isn't made up of solid colour – nothing too dirty, but enough to make the asset realistic.

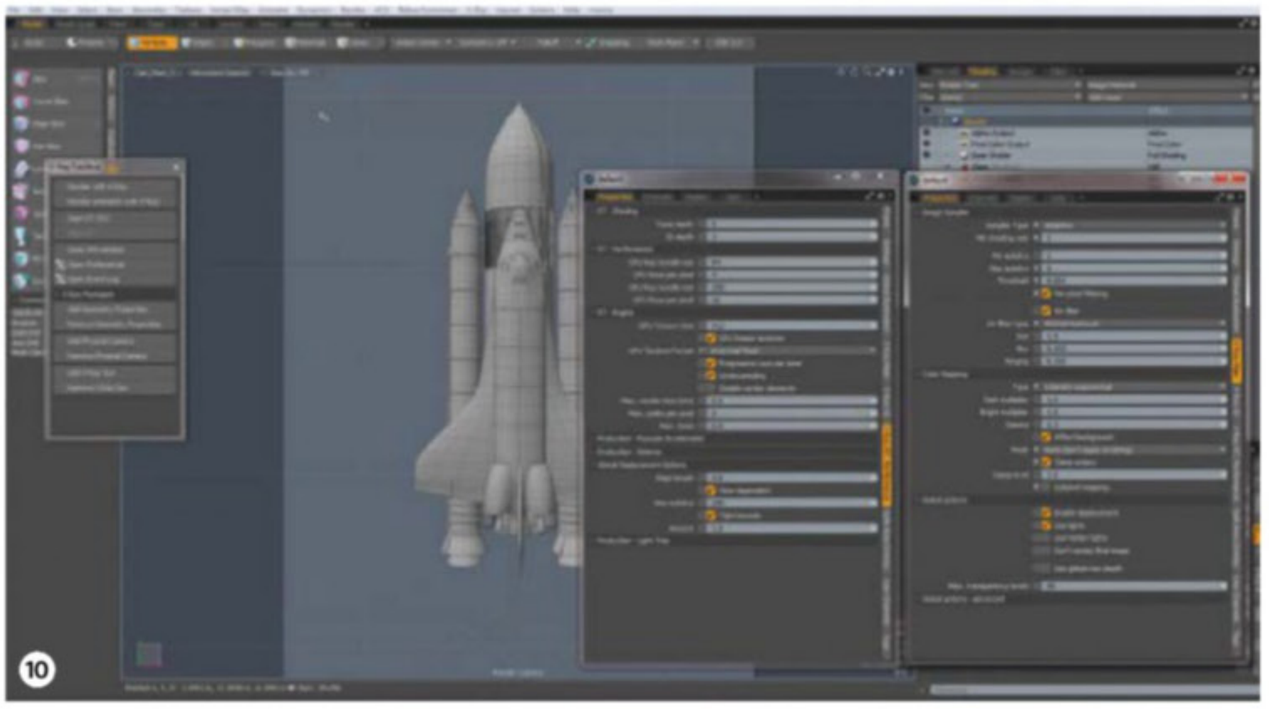




08 Send into MODO From here we are going to export all the maps from MARI and set up the layers in MODO's Shader Tree. To export all the maps, Ctrl/right-click on a channel and go to Export All Channels Flattened. Importing the files into MODO is easy – simply click the Clips tab, then Add Clip. After that you can load your UDIMs. Let's set the Material channel of each map we'll use. Do this in the UV mode and select each patch in Poly mode. Press M and input the appropriate MARI patch number, then create a few extra tags to enable editing of the other parts separately.

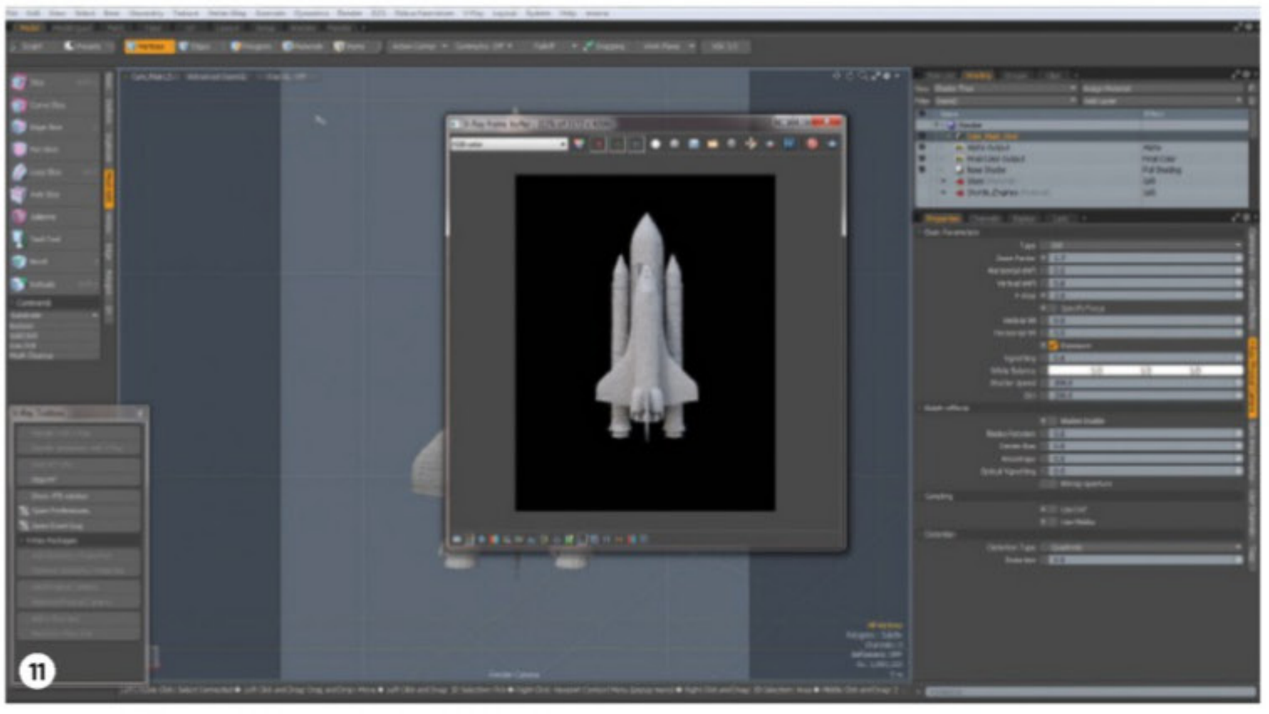


09 Set up the camera From the start of my project I decided to have the shuttle launch vertically. Add a normal MODO camera and have a standard Directional light in the scene. Since we're going to use V-Ray to render this, there are some added benefits to this. First of all, we want to use the V-Ray Physical Camera in this scene as well as V-Ray Sun and Sky. To do this, we need to be in Item mode. Bring up the V-Ray Toolbox by clicking the V-Ray tab then clicking V-Ray Toolbox. This pop-up box will bring a panel with some of the major options that we can add or edit. Click Add Physical Camera while having the basic camera selected. Do the same with the Directional light to add the V-Ray options.



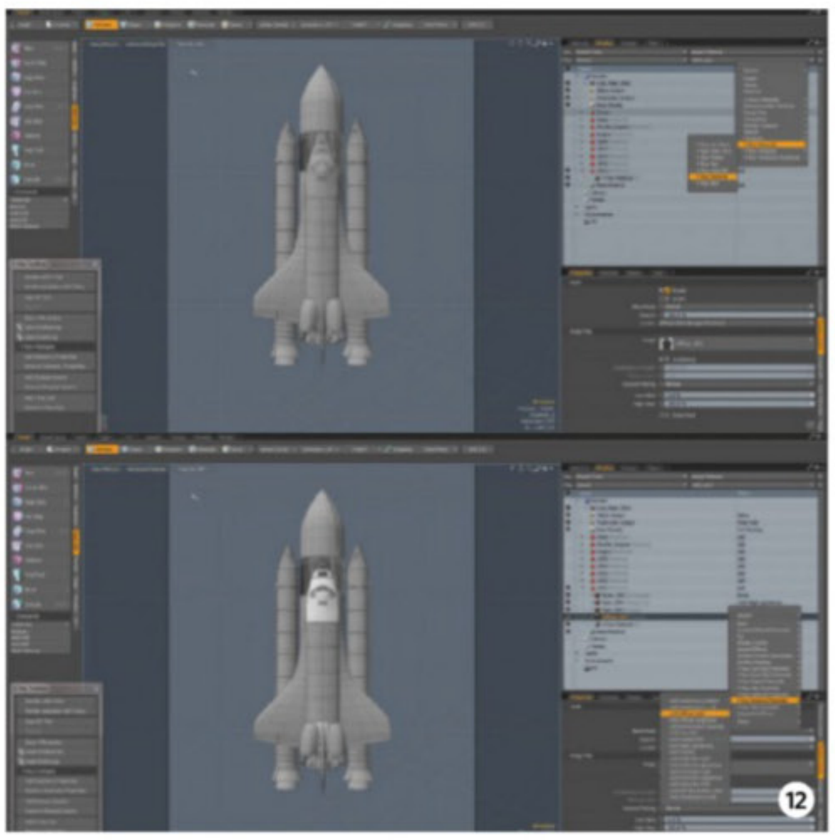
10 Light the scene Next, we want to use the V-Ray IES as well as the V-Ray GI to help light the scene. To enable these, click the main Render tab and click to enable both IES and V-Ray GI. Since we're in this area you also have your Main V-Ray and V-Ray RT panels where a good portion of your adjustments will reside. I've also added an additional HDRI map to my environment to add more light.

11 Complete the environment As we continue with setting up our scene, we'll need to adjust the Physical Camera for our shot. You will notice that you have many of the same options that you'd find in other packages with V-Ray's Physical Camera. We also need to adjust the V-Ray Sun/Sky. Use the V-Ray RT preview to do any edits and to see feedback.

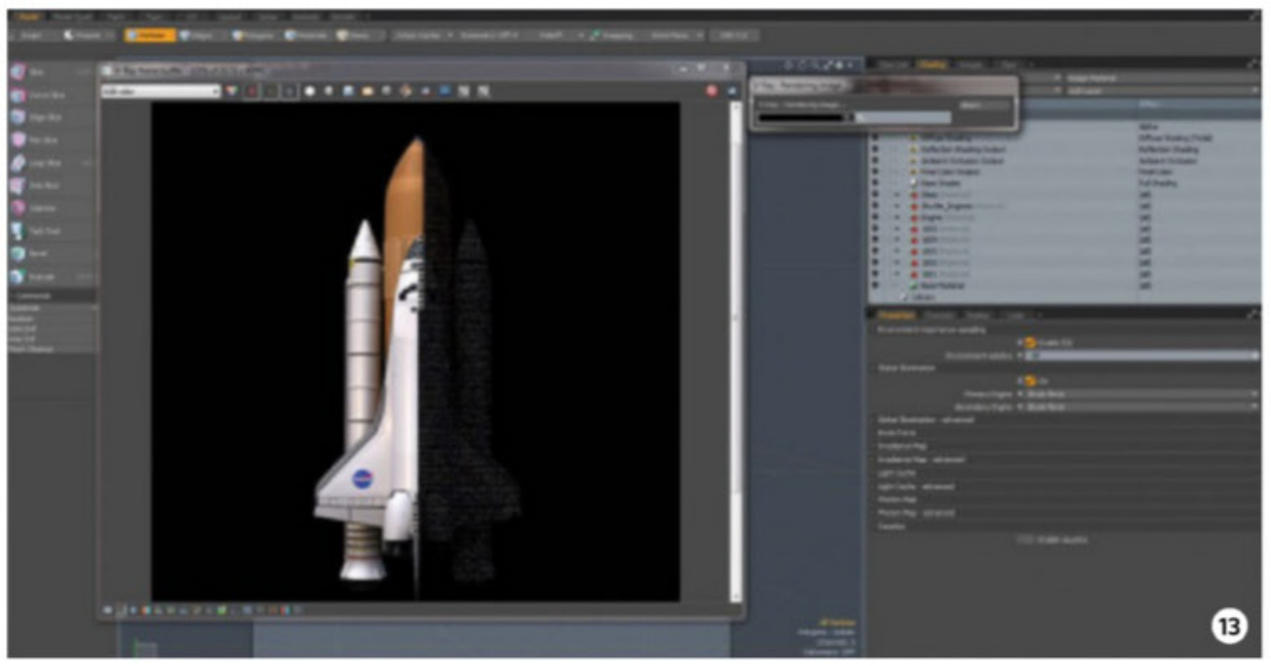


V-Ray For MODO

A big thanks to Chaos Group for allowing me to provide a sneak preview of the new upcoming render plug-in that everyone has been waiting for. Despite being in its early stages, I found that the build I used worked very smoothly, and I'm sure there are many functions within V-Ray that will be a welcome addition to any MODO toolbox. Setting up render slaves that work flawlessly within the V-Ray preview, as well as running final renders, is quite awesome.

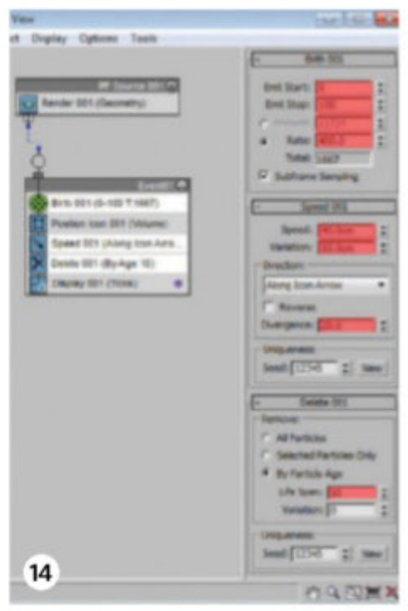


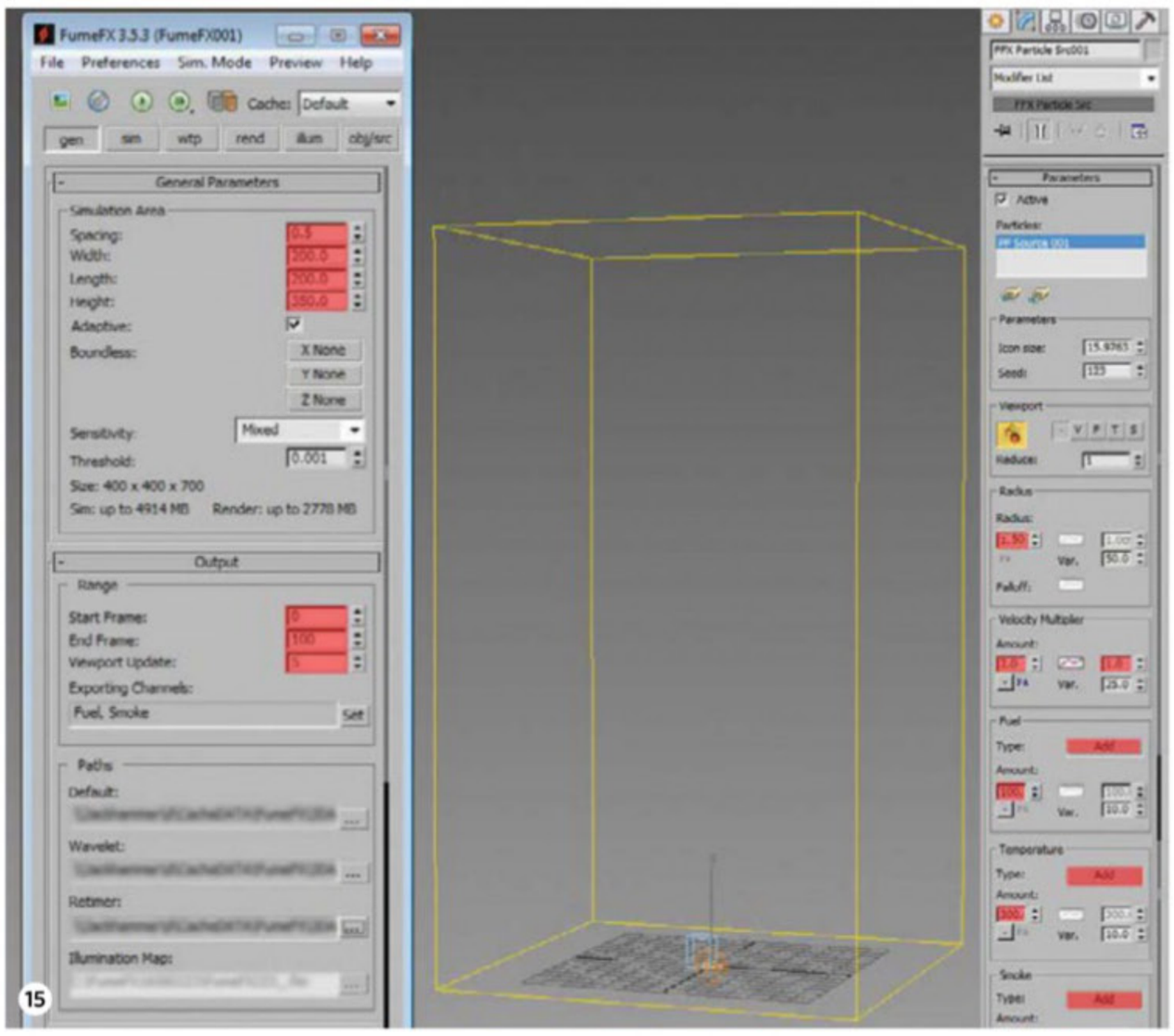
12 Set up the material Now it's time to set up and finalise the materials. I decided to use the base V-Ray material for this project. To do this, simply click Add Layer then scroll down to the V-Ray Materials tab and press V-Ray Material. We'll need to add the Diffuse map and the remaining images. You can add an image map by clicking the Add Layer tab then pressing Add Image Map. Now it will default to Diffuse Color. We need to change this by Ctrl/right-clicking and scrolling down to V-Ray Diffuse Color. Do this for all other maps so we can adjust the reflection and other settings.



13 Render the scene Now we are at the point where we want to render the final image. The good thing about V-Ray is the sheer amount of information online about its render settings. It is quite easy to nail down the noise along with some pretty good render times. You can also set all the outputs in the Normal spot in the Shader Tree, which will save it all in one go after the V-Ray rendering has been completed.

14 Create a basic Pflow Start with a Standard Flow and delete the Rotation and Shape operators. Set the Emission span from frame 0 to 100 and the Rate to 400. The Speed should be set to 40 with some Variation and a Divergence of around 20. Add a Delete Operator and set it to Particle Age with a value of around 10.



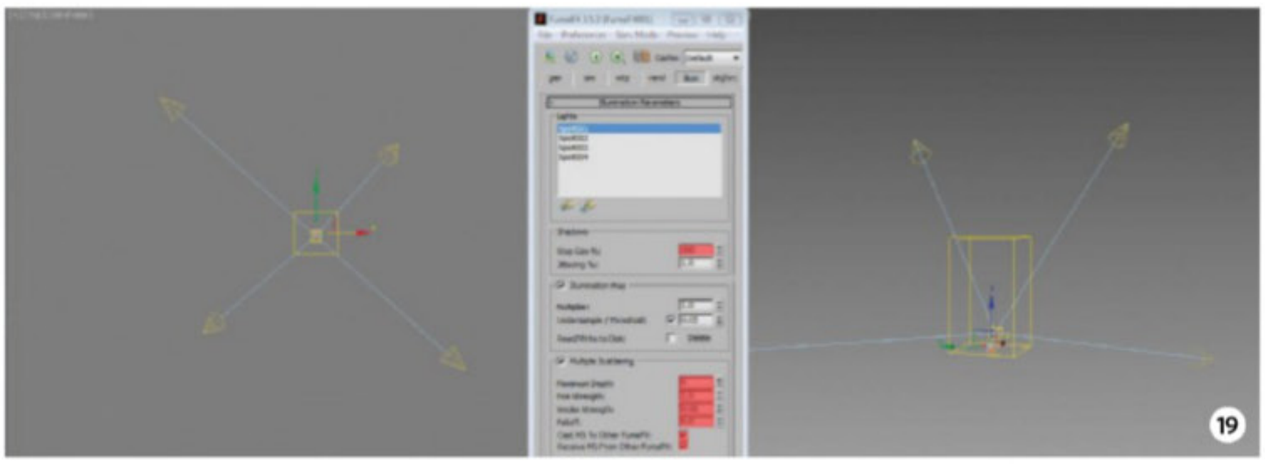


15 Add a FumeFX grid Create a new FumeFX grid with the Dimensions 200x200x350. Set your Spacing to 0.5, which should use up to 5GB of RAM. Create a Particle Source and add your Pflow. The Radius of the emission particles should be set to 1.5. The Velocity Multiplier should be high in the beginning and then dim down – around 2.0 to 1.0 over the particle lifetime. Ctrl/right-click the Curve Editor icon to activate the curve. All values should be set to Add. This will add the amount in the spinners per sub step, resulting in a lot of heat and smoke, just like the real deal. I used a Fuel Amount of 100, Temperature of 300 and Smoke Emission of 7.

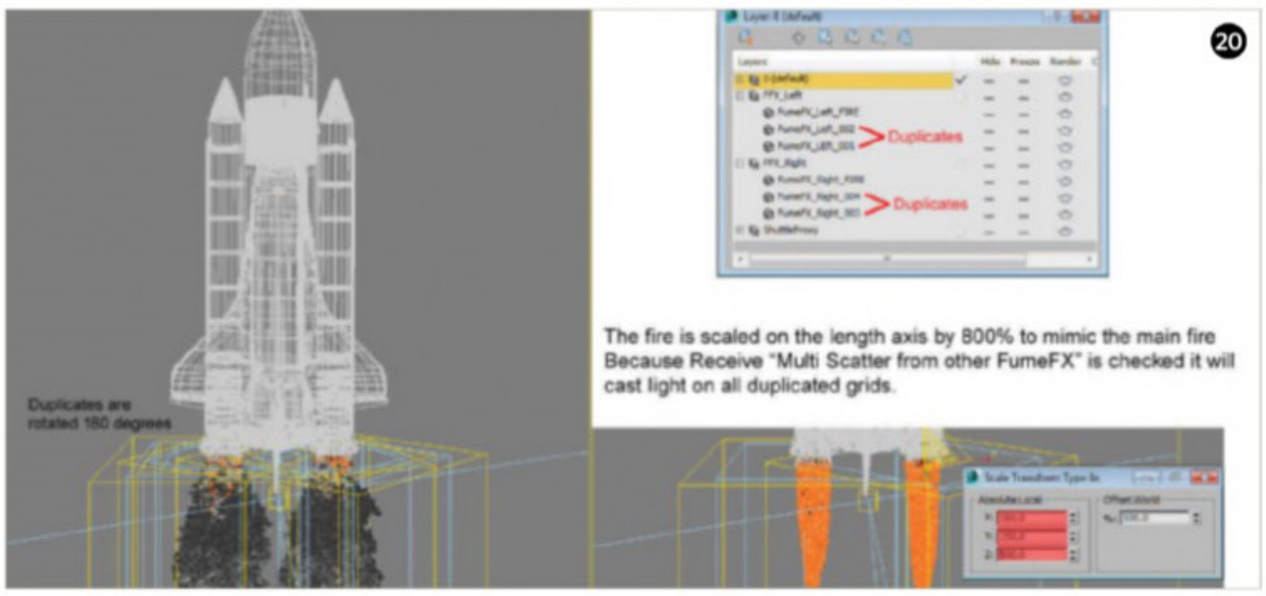
16 Simulate the movement In the Simulation tab, set our Quality to 5 and Maximum Iterations to 250. The Advection should be set to Advanced. Advection Stride should be 1.5 and Cubic Interpolation should checked to enable extra fine detail. Set the Vorticity to 0.85, to add grid detail. Set your Turbulence to a low value like 0.04 with 25 frames and with Detail set to 3. The scale should be small, as we want the Turbulence to add just some subtle details.

17 Continue simulating In Fuel, set the Ignition Temperature to 100 with a Burn Rate of 80 and a Variation of 1.0 This will only burn very hot fuel at a very fast pace. Heat Production should be 800 or higher with an Expansion of 2.0. Fire Creates Smoke should be checked with a Density of 12. In Smoke, set Buoyancy to 0.5 with Dissipation Min. Density of 0.5 and a Strength of 8. Temperature Buoyancy should be set to 0.5.

18 Define the details In the Rendering tab set the Fire Opacity and Color to 0.5. Open the Gradient and add a five to ten new flags, colour them orange to dark-brown, then keep them alternating. This will give extra detail where there is none in the shader. In the Smoke section, set the Opacity to 2.5 and adjust the opacity curve to point down. The Color Gradient should have a few new flags with brighter and darker-greyish tones alternating to give the internal shader detail. Make sure that Cast Shadows and Receive Shadows are both checked.



19 Light the thrusters In the Illumination tab, add four spot lights and align them to shine on the FumeFX grid from all the corners at alternating heights. Ensure that they're set to Cast Shadows if you want alternate the colours in the lights to more blue and orange colours. Set the Step Size to 300 for faster renderings, but rougher Shadow maps. Check Multiple Scattering and set the Depth to 6 with a Fire Strength of 1.0 and a Smoke Strength of 0.01, which will make for high scattering from the fire. Falloff should be 5.0 and both Casting MS and Receiving MS should be checked. The last frame of your simulation should look like this step's image.

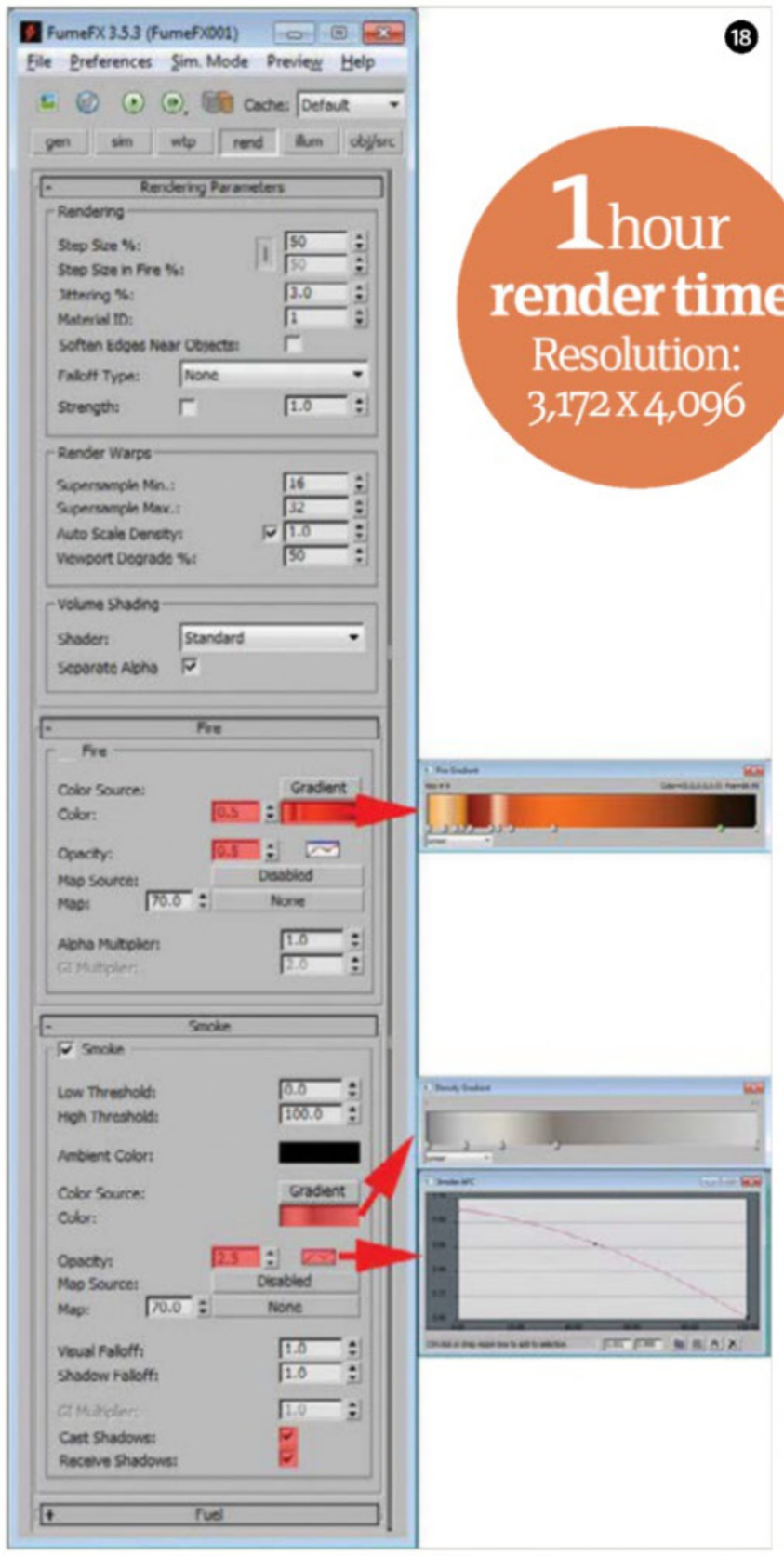

20
Duplicates
Duplicates
The fire is scaled on the length axis by 800% to mimic the main fire
Because Receive "Multi Scatter from other FumeFX" is checked it will
cast light on all duplicated grids.
Duplicates are
rotated 180 degrees

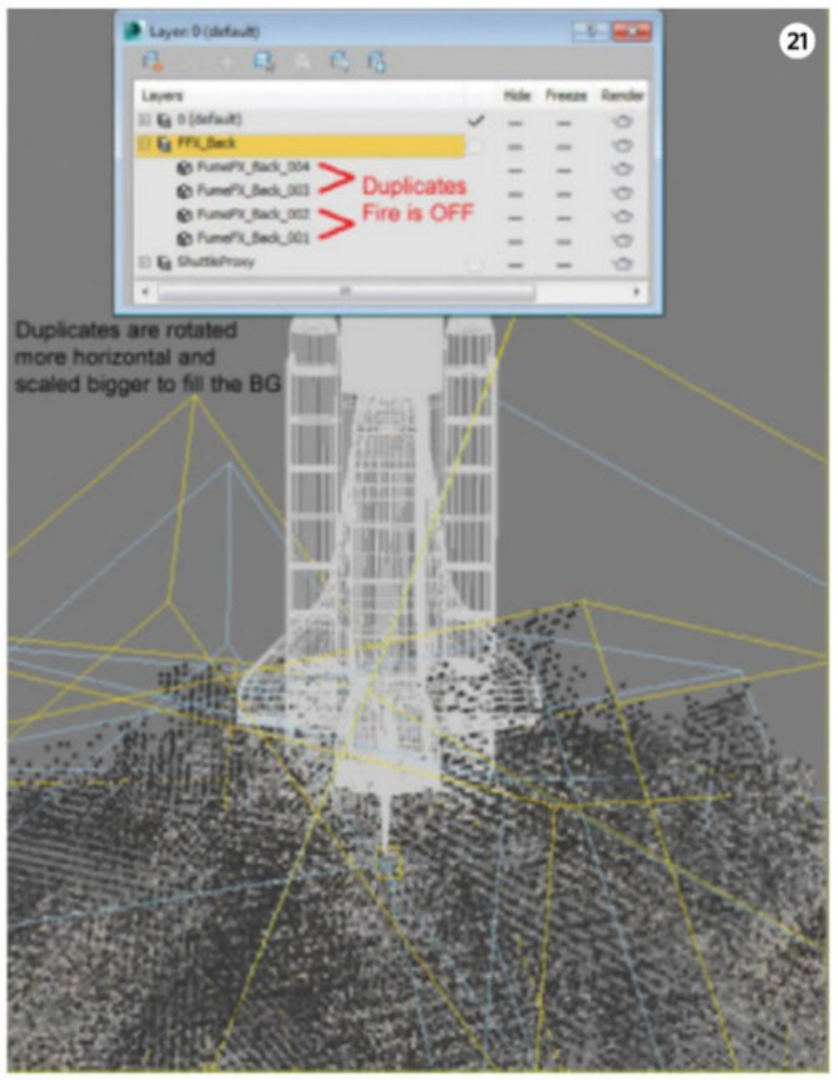
20 Render the thrusters First of all, move and duplicate the single grid to where it belongs in our scene, which is at the thrusters/engine. The trick to add extra detail is to duplicate the grid a few times and rotate it. Scale your grid over the diagonal axis in one instance, then duplicate the grid a third time and uncheck the Smoke Render flag. Scale that grid to 800% over the vertical axis, which should result in a pointy fire thruster. As the Receive Multi Scatter From Other FumeFX is checked, it will cast light on all the other FumeFX grids. In total, this means we have three grids per engine.

21 Create the background smoke For the background, keep duplicating your FumeFX grids and uncheck the Fire box in the Rendering tab. Scale them to your liking. Duplicate it four more times and rotate it to fill in gaps and to cover up the entire background. Once you have finished your simulation, you can composite it into the main image using Photoshop.

Simulate the scene

The key to this image is not only the simulation, but how to duplicate and alter existing simulations to beef up your image. No need to simulate giant grids with all kinds of motion – one grid will do! With FumeFX you can also use FFDs and so on, as long as you use the Geometric/Deformable ones from the Space Warps tab, but a regular FFD modifier on a FumeFX grid wouldn't work.





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Technique focus

Incredible 3D artists take us behind their artwork

MODELLING With this project I started by blocking out rough shapes and duplicating parts around to find a good shape for the design. I used groups of existing models, duplicated them and moved them around to see which ideas worked. Once happy with the overall shape and silhouette, the rest was just modelling and adding details to hold the shapes together. **C.ROACH,** 2014

Tham Hoi Mun

Website http://xylacindustry.tumblr.com

Country Malaysia

Software used Maya, KeyShot

Bio Hoi Mun is a concept artist based in Kuala Lumpur working on triple-A titles with Passion Republic

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Technique focus

Incredible 3D artists take us behind their artwork

PHOTOREALISM I started this image by modelling an egg box. The next thing was to fill it. For the eggs I used procedurals, as I love this type of texture. The illumination was very simple – just an IBL setup, a one-point light to fill and add an extra rim light. Finally, some post-processing was useful for adding a little glow and lens dispersion. **Breakfast,** 2014

José Luis Rozúa Lucena

3DArtistonline

Username: zbrusher

Website
www.broadcastingcomics.com

Country Spain

Software used
Blender

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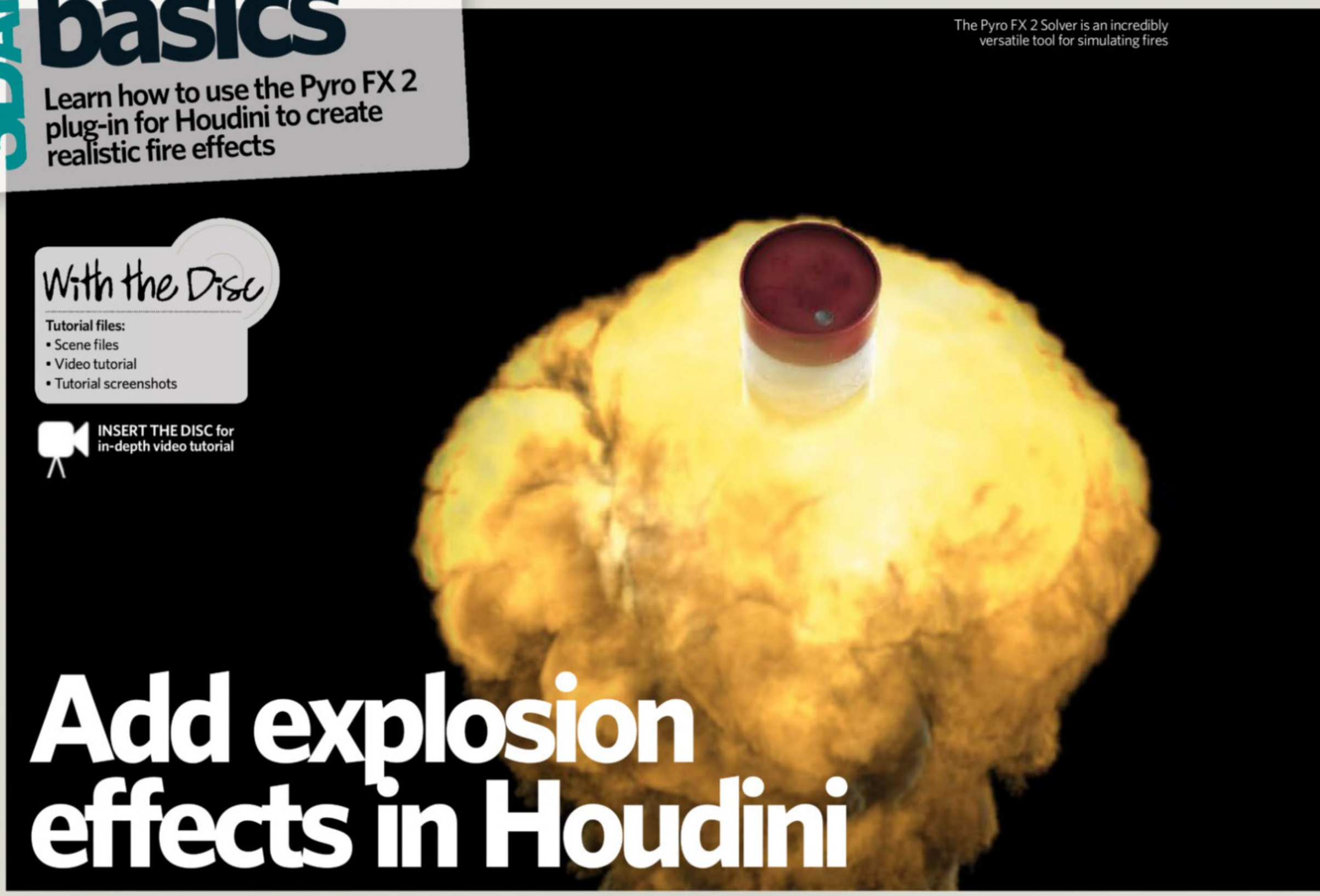
Back to basics

Learn how to use the Pyro FX 2 plug-in for Houdini to create realistic fire effects



The Pyro FX 2 Solver is an incredibly versatile tool for simulating fires

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Add explosion effects in Houdini

"In this tutorial you will develop an understanding of Houdini's powerful Pyro FX 2 Solver, with the aim of creating a realistic explosion effect"

If you want to achieve realistic fire effects in Houdini FX 13, you will have to develop an understanding of the powerful Pyro FX 2 Solver and how important it is to have the correct source object. To work through this tutorial, we will use a pre-made and specially prepared explosive barrel mesh, including a geometry that represents the amount of fuel that will feed the fire. You'll find this on the disc.

We'll head over to the shelf bar and use the Pyro FX 2 Solver preset, which will automatically create all the necessary nodes. At this point we will dig into the functionality and explore how all the major parameters are intertwined, especially those that define the visual appearance.

There is a big difference between the Pyro FX 2 Solver and particle networks in Houdini FX, as the default Pyro works with an activated combustion model. This is what we'll focus on the most. Fire and smoke won't be emitted directly from the source like it would be in a particle system, but from a Fuel field instead. In our case, this is the supporting geometry inside the barrel, which will first be converted. If the temperature is high enough in this field, the fuel will ignite, and the vital spark will come from the Burn field.

This temporary Burn field is there for controlling the process of converting fuel into flames and smoke. However, from a technical point of view, there are other unexpected results, rather than simply fire and smoke. Additional side effects are temperature changes in the Temperature field and changes in the Divergence field, such as expansion in space.

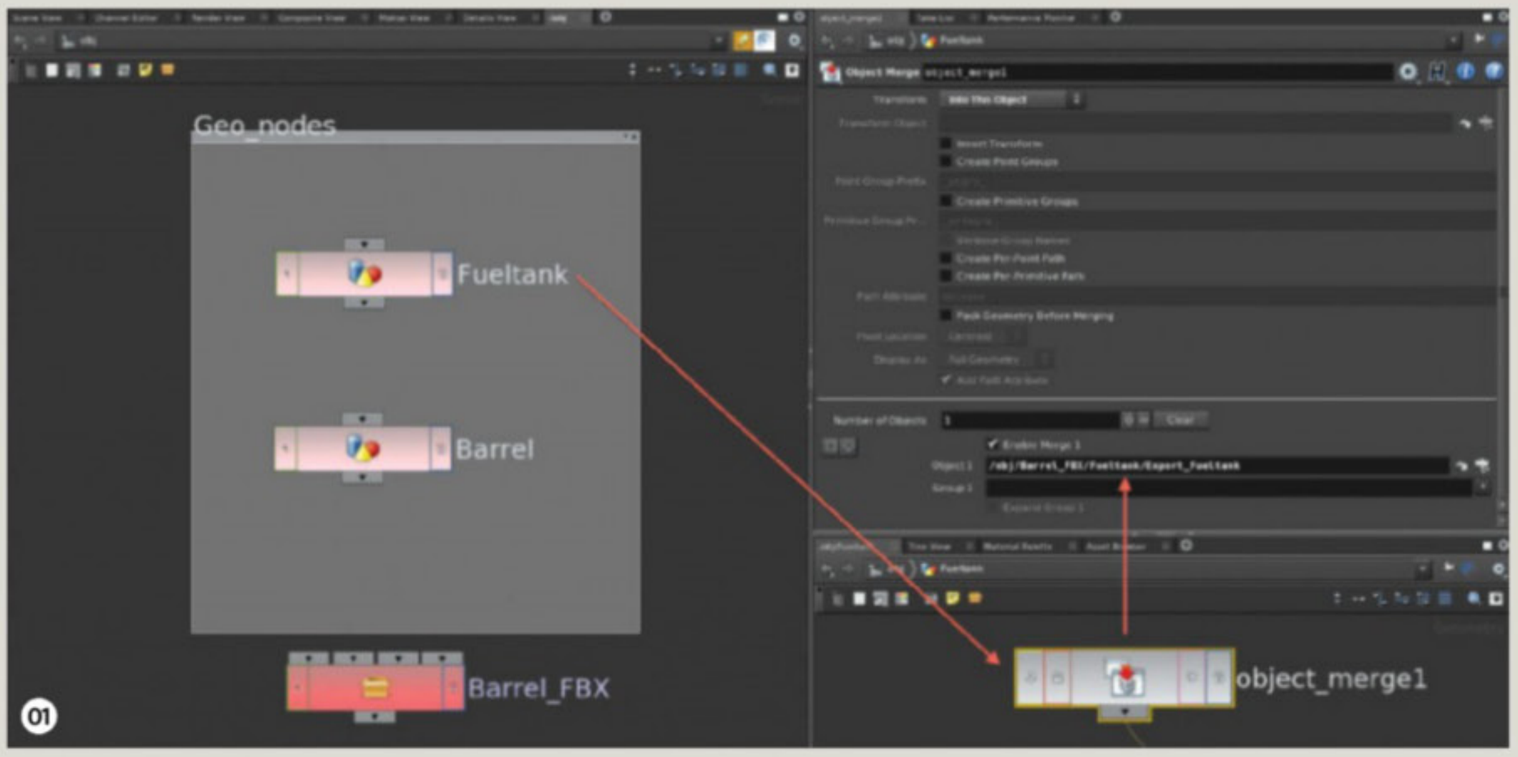
At this stage, it's really important that the Heat and Burn fields are not working in the same way. Heat lasts for a couple of frames and the Burn field will be recalculated in every frame. Our target is to understand the connections between all of these fields, how they can be adjusted to create an explosion and, of course, match explosions based on your needs.

Furthermore, we will use the barrel mesh and other geometries as collision for the fire and smoke. This means we'll use the geometry to create Collision fields that will enable us to customise the simulation for its environment. In the final step of this tutorial, we'll take a look in the Mantra node and explore how to improve your rendering for the visualisation with Micropolygon Rendering. Last of all, we will set up some lights to improve the look.

Add fuel to the fire

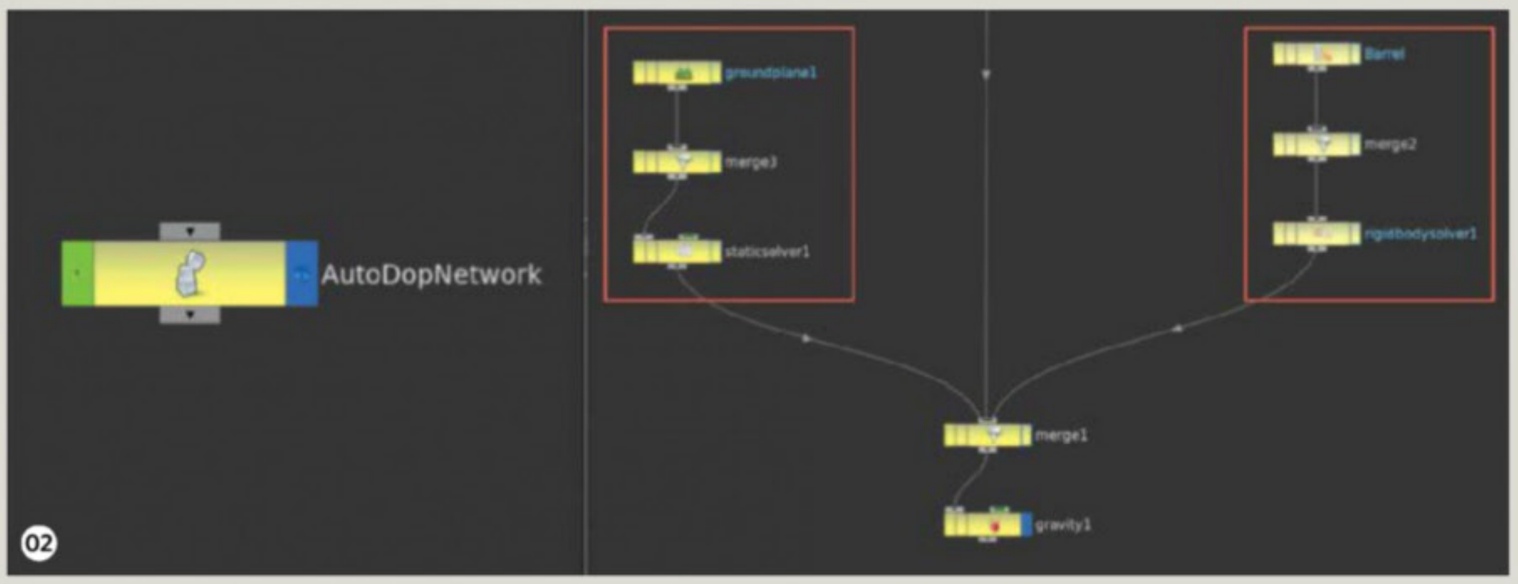
01 Set up your work environment

First of all, import the FBX file from the disc via the File menu and import the Filmbox FBX. Open up the Barrel_FBX node. There are two more nodes in here named Barrel and Fueltank. Add a Null node inside each of these nodes and append them to the File Import nodes. In the Network Editor pane on the OBJ level, we must create two new Geometry nodes and delete the Inside nodes. Now replace them with Object Merge nodes. Under the Object 1 parameter field in each Object Merge node, add a link to our Null nodes.



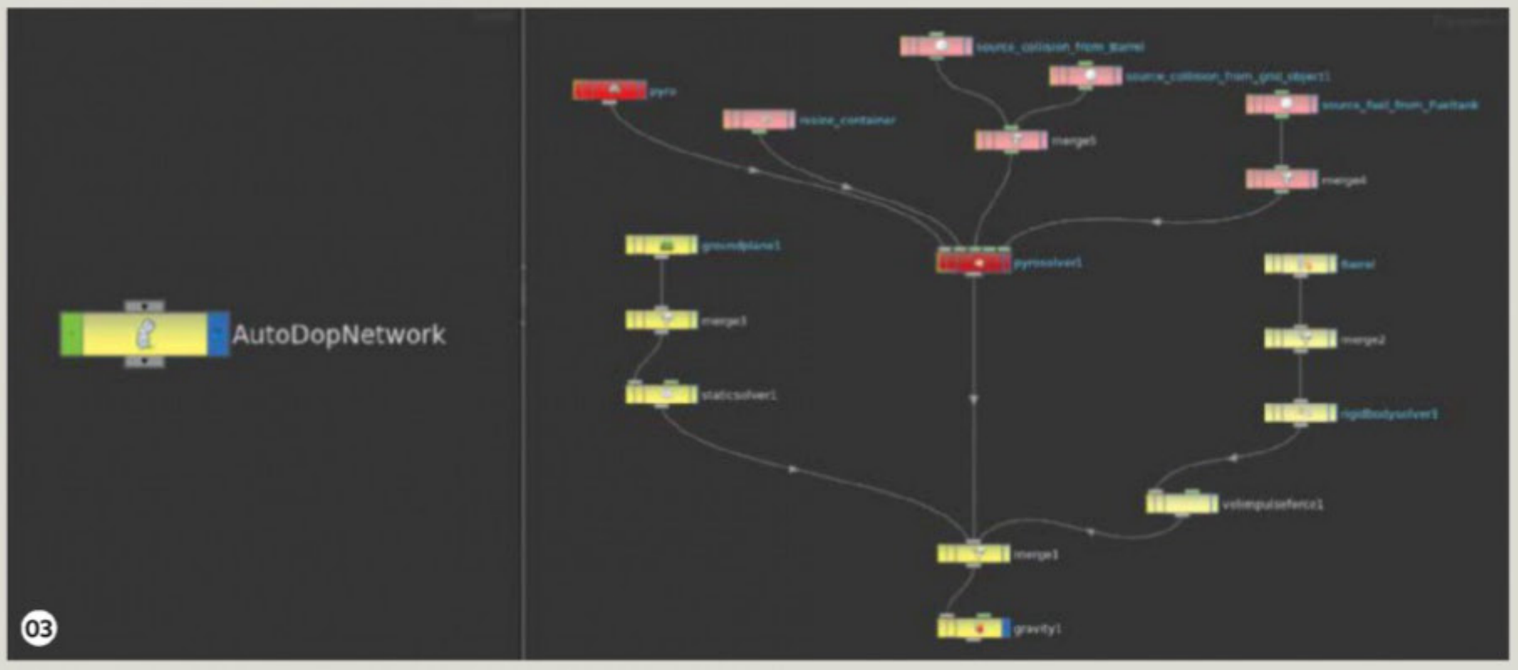
02 Bring the objects to life

Now it's time to add dynamic features to our scene, including two more sections to support the dynamics later on. First, add a ground plane via the Rigid Bodies shelf. Just press the Ground Plane symbol located on the shelf and it will be generated automatically. Afterwards, select the barrel and on the same shelf press the function for the RBD Object preset. At the same time, we need to get an Auto DOP Network ready with basic functions. Next up, create a grid from the Create shelf and scale it by the factor 100 in X and Y.



03 Add the vital spark

Now it's time to select the fuel tank and apply an Explosion preset from the Pyro shelf. This way of creating a simulation gives beginners an easier access to all the basic functions. To have a clear view of our simulation, hide the Barrel_FBX, Fueltank and Barrel object nodes by removing the blue field on their nodes in the Network Editor pane. If you press the Play button, the rough explosion will start and continue until the end of the timescale. To improve it, take a look at the Pyro Solver that lies in the Auto DOP Network.



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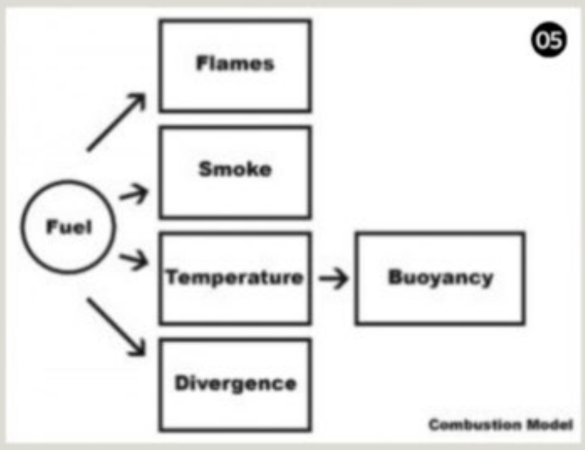
Back to basics

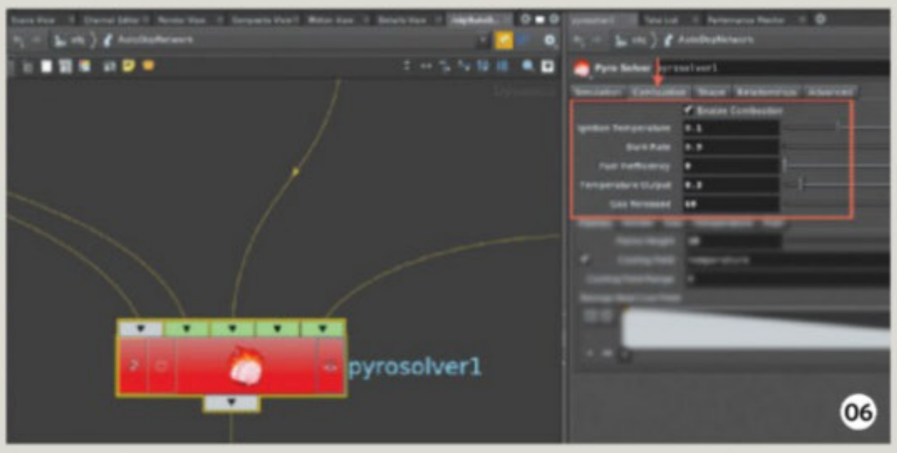
04 Define the simulation

The first tab in the Pyro Solver that we will explore is called Simulation. Here we'll define the way in which our barrel will be simulated. Change the Timescale to 1 – as the name says, this parameter controls how fast your simulation will work. Temperature Diffusion acts like a blur filter relating to the Temperature field. Increase this parameter to 0.15. The next parameter to be changed is the Cooling Rate, which controls how fast the Temperature field will cool down, so set it to a value of 0.9. This means that the temperature will be cooled down to 10% of the original value every second.

05 Create the lift

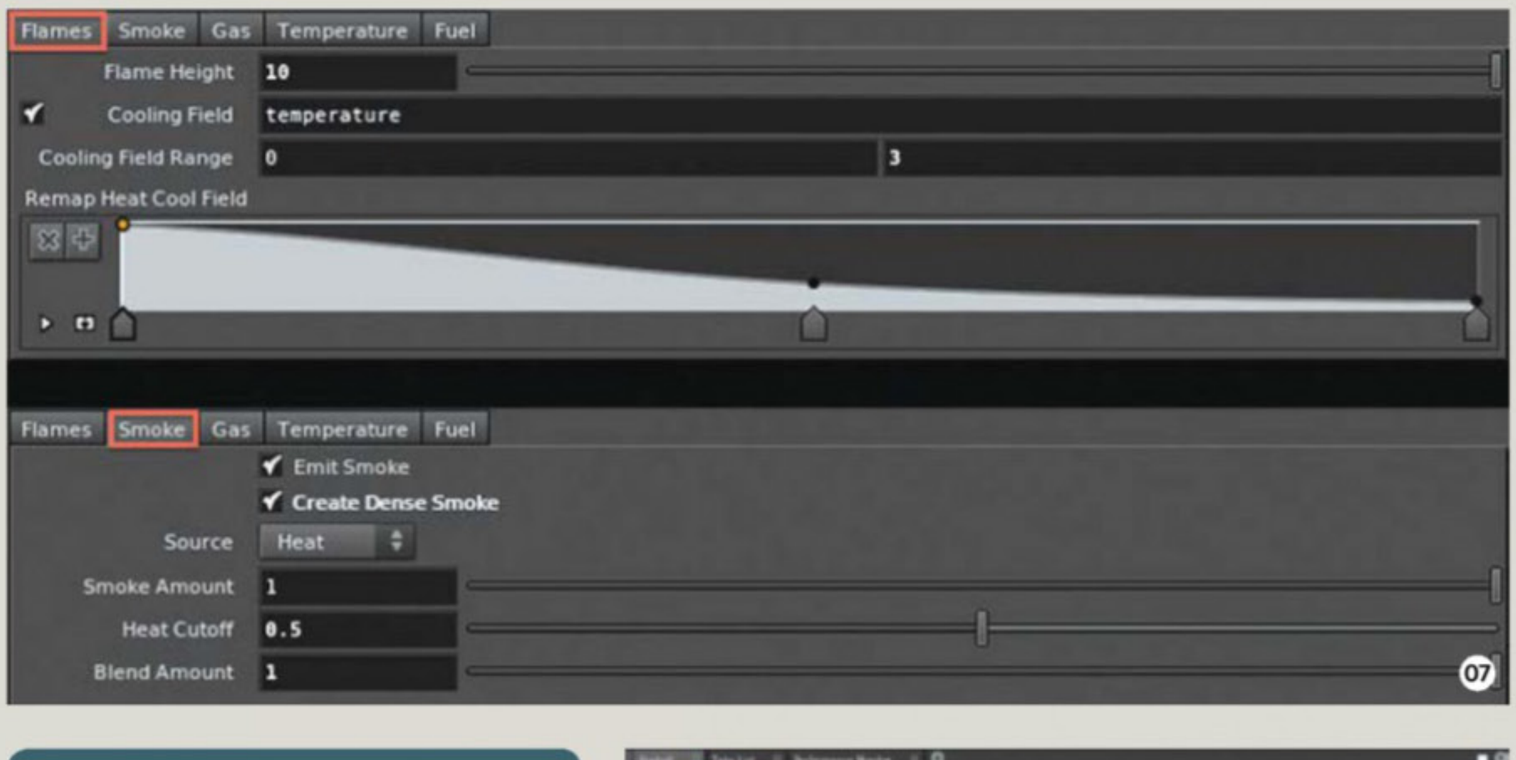
An important parameter for the barrel explosion is the Buoyancy Lift. This controls how fast the hot smoke is moving upwards and how fast the cool smoke will sink. Pick a high value of 200 and leave the Buoyancy Direction as it is. Now we'll work in the Combustion tab. The combustion model was described earlier, but this time we will adjust it. Leave the Ignition Temperature (the value at which the fuel will ignite) and Burn Rate (which defines how rapidly the fuel will be burnt) at the defaults. This will define how much fuel will be burned.





06 Set up the fuel field

We need to adjust the Fuel Inefficiency as well. By putting a 0 in the parameter field, we're telling the Pyro Solver that all the burned fuel in the Fuel field should be removed. To add a bit more drama to the simulation it's necessary to increase the Temperature Output to 0.3. Basically there will be a higher temperature for the same amount of fuel. For even more dramatic effects, try increasing the Gas Released parameter to 60. That parameter controls how much the flames and smoke will expand, which is principally a control for the Divergence field.

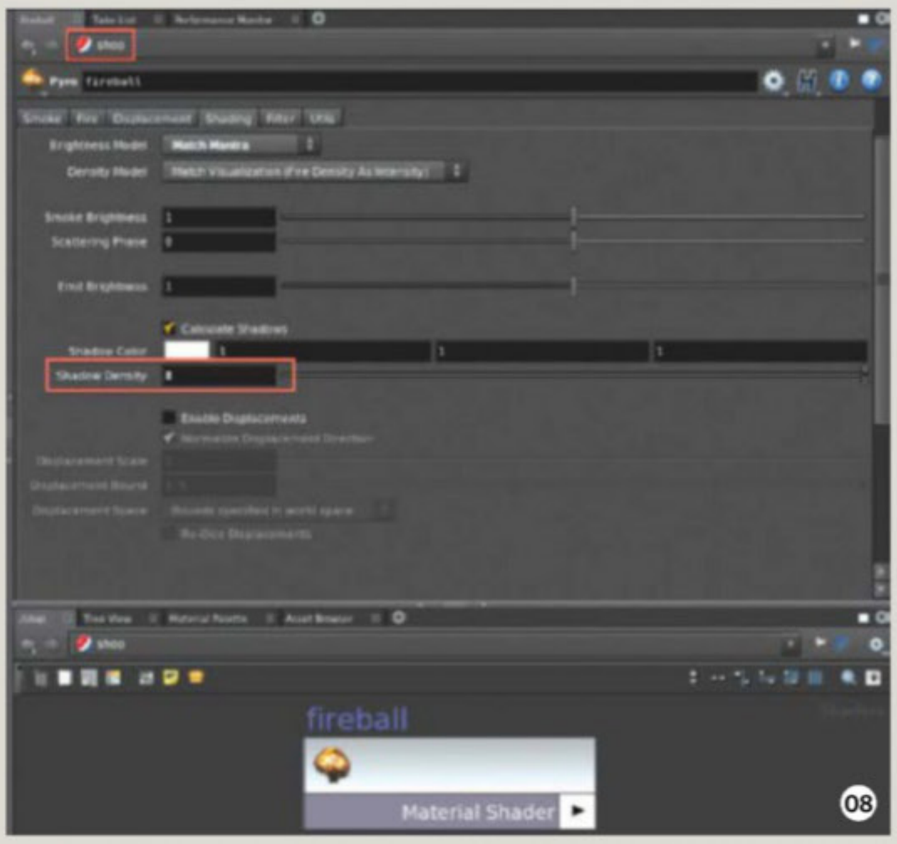


07 Increase the flames and the smoke

Below the Gas Released parameter are tabs to enable in-depth control to aid with controlling the flames and smoke, which is our next point of focus. First of all, we need to head into the Flames tab and increase the Flame Height to 10. This means cooling for the flames will be slowed down, and as a result we'll end up with higher flames. In the Smoke tab we want to emit smoke and we want the Create Dense Smoke option active to create a heavy explosion effect. We also want to ensure that the smoke comes from the Heat field respectively. Heat Cutoff must be set to 0.5, with Blend Amount set to 1. This controls which parts of the flames produce smoke.

Speed up your rendering time

One common way to optimise the rendering times is located in the sector Shadow Calculation. First of all, choose Micropolyon Rendering as your rendering engine. Simply create a new Mantra node and dive into the Rendering Properties. Once here, you can switch the mode. Now as Mircopolygon Rendering is set, it's time to activate Z-depth Shadow Calculation, which is optimised for non-PBR Micropolygon Rendering. Select all of the lights, jump into the Shadows tab and change the Shadow Type to Depth Map Shadows. You can also increase the shadow's quality and the size of the Shadow maps according to how you want your result to look.



08 Work on the shader

Now as the general behaviour fits the needs of our scene, it's about time to adjust the shader to ensure that the visual quality of the render is suitable. The first thing we need to do is to go to the Network Editor pane and switch the view from OBJ to Shop. Here we'll see a Fireball material shader. Let's start at the Shading tab. The Brightness Model must state Match Mantra and not the Visualisation. After these adjustments, the Shadow Density should be set to 8 to darken the shadows.

09 Shade the smoke properly

Let's delve into the Smoke tab. In the Color field, activate the Physical tab to reach the physical controls of the visual quality. A value of 3,000 Kelvin is a good choice to ensure a realistic-looking smoke effect. At this stage we can also play with the Density parameters in the Density tab. To lighten the smoke up a bit, it's necessary to increase the Ramp Interval from 0 to 4. After this change, we'll need to make sure that the Source Range is set from 0 to 2 for a good density balance.

10 Set the simulation's temperature

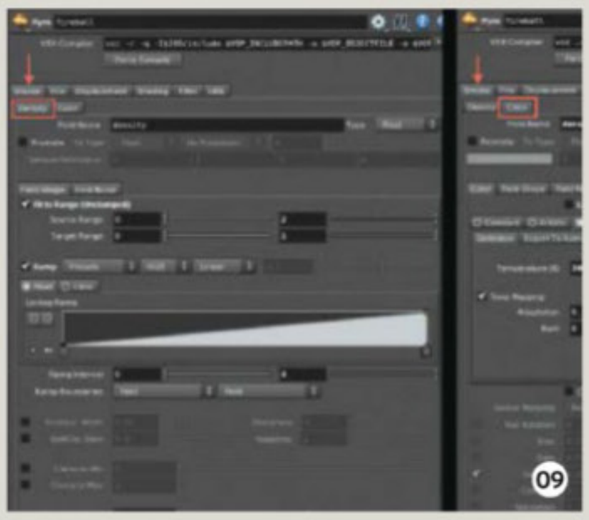
Inside the Fire tab, the same parameters are available as are in the Smoke tab. With this in mind, under Color, let's change the Type to Physical as well. In this case, a temperature of 2,000 Kelvin will be fine. However the density of the fire needs a few more adjustments, especially at the Source Range. Here we will need a Source Range from 0 to 12 and a Ramp Interval set to around 0 to 6. Now the fire shouldn't look too bright. The really hot fire that hasn't cooled down is now significantly separated from the other heat stages.

11 Blow up the barrel

For our simulation, let's imagine that the explosion is so intense that the barrel will lift off in Y direction due to the pressure. To achieve this, go into the Auto DOP Network. Now add a Velocitiy Impulse Force node from the Tool menu and connect it between the Rigid-Body Solver and the Merge node above the Gravity node. In the parameters, change the Velocity Change parameter in the Y field to 350, X to -30 and Z to -10. That will let the barrel surf on the heat wave. For the Activation value, we'll need to add in the $F == 5 expression to start it at frame five.

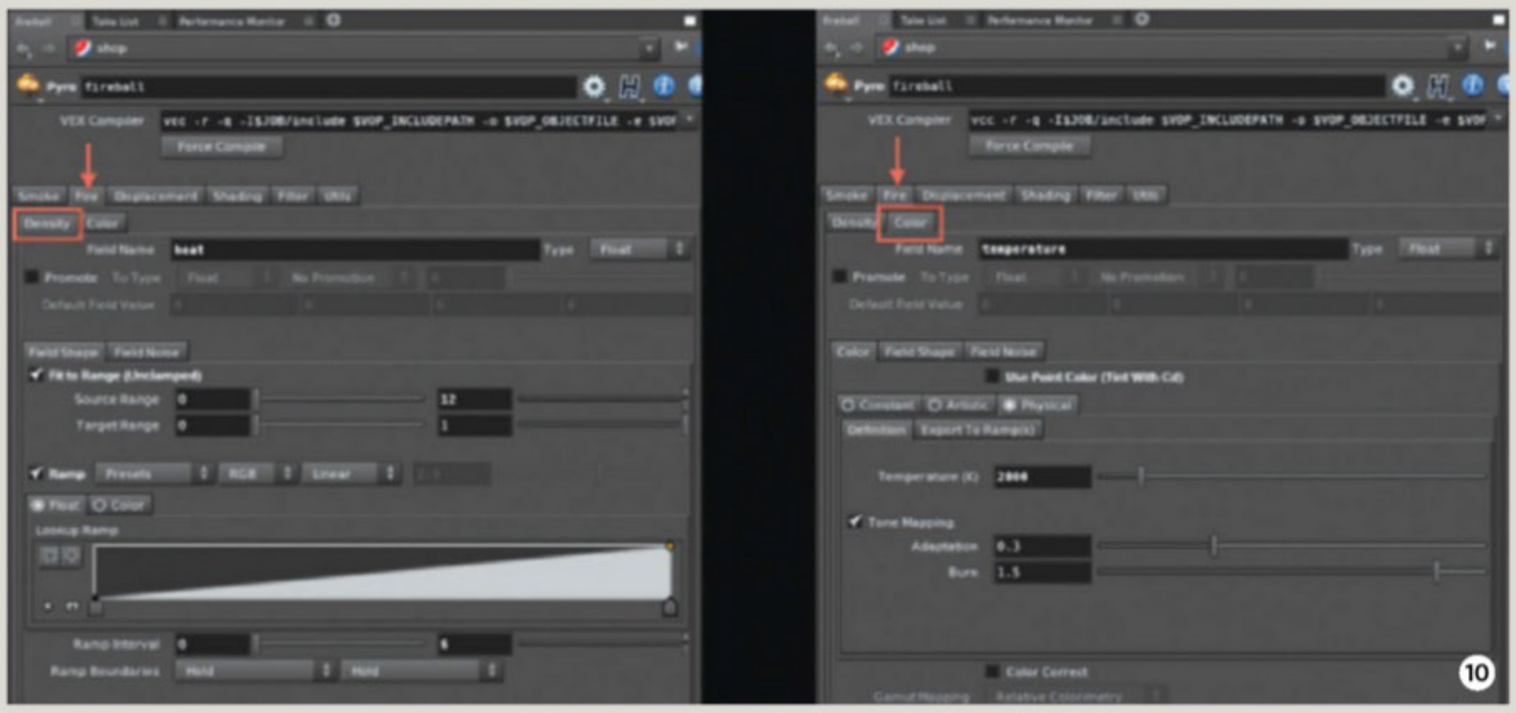
12 Ensure that the simulation is realistic

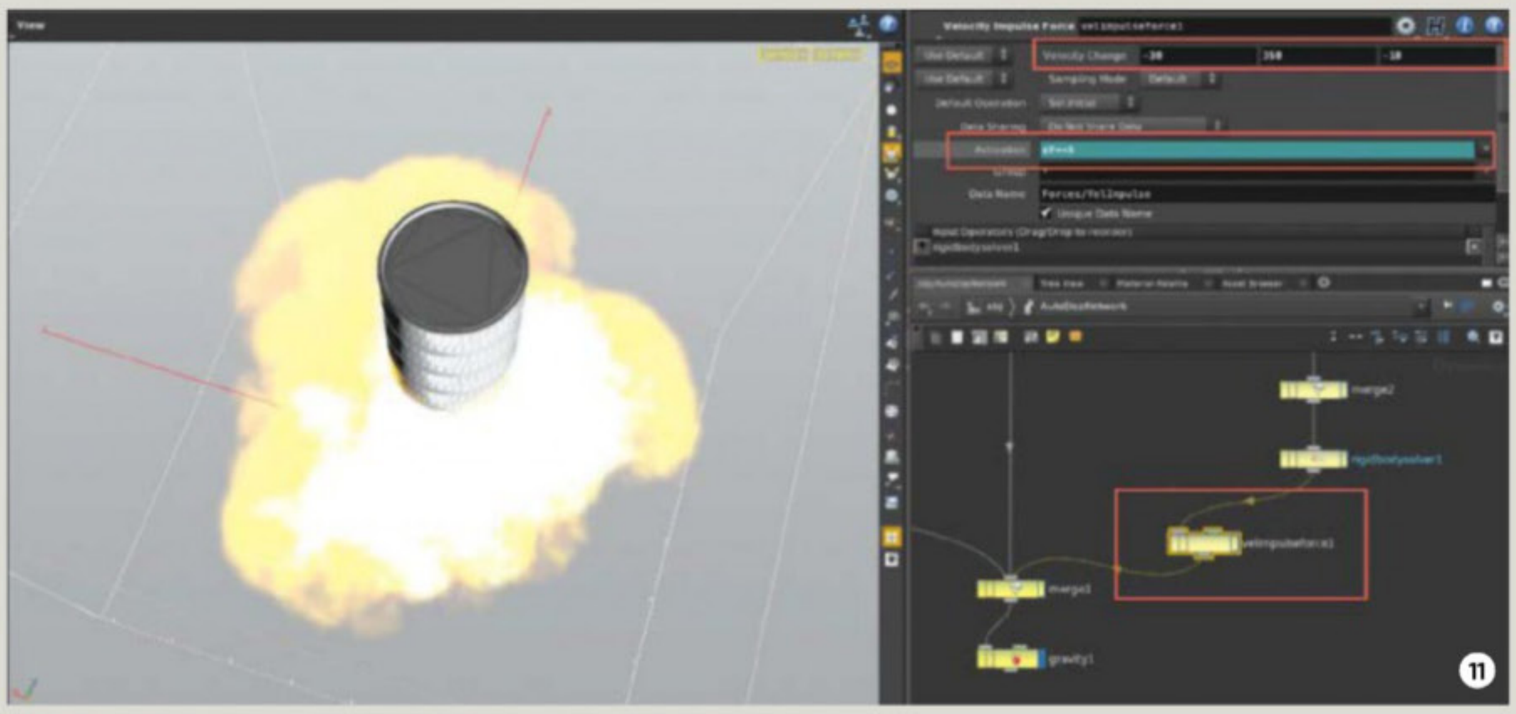
We want the explosion to behave in a realistic way, which means that the smoke and the flames shouldn't cross mesh borders, especially not the ground. Basically, we're talking about Collision fields for the simulation. First we must select the Grid node, which is our ground. After this, we'll take a look in the shelf called Populate Containers. Let's choose the Collide With Objects function and select the Pyro container that surrounds the fuel tank. The same must be done for the barrel mesh. The Auto DOP Network and the object nodes will be updated automatically.



Boost the quality

At the moment, the simulation quality it at a kind of preview quality, which is used to give you a moderate speed level to work on the behaviour refinement. To increase the overall quality on a more global level, you can simply add more voxels to your simulation. To increase the number of voxels, you'll need to shrink down the actual voxel size. Just jump in the DOP Network and take a look in the Smoke Object node – called Pyro when you're using the shelf tools – which is connected to the Pyro Solver Object Input. In the Parameter pane, simply decrease the Division Size to a lower level.





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Masterclass

Gustavo Åhlén is the founder and creative director of Svelthe. He is also a professional 3D/VFX designer and matte painter for films and games

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Sculpt human arm muscles in ZBrush

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In part three of our anatomy masterclass, we're going to take a look at sculpting the arm muscles on a skeleton in ZBrush. To help you along, there's also a video tutorial supplied on the disc. Before we delve into the sculpting process, we need to define the sections of the arm muscles. These can be divided into three sections: the upper-arm muscles, the forearm muscles and the hand muscles.

The upper-arm muscles are made up of the brachialis, biceps brachii, coracobrachialis and the triceps brachii muscle, with some of these contributing to the movement of the elbow.

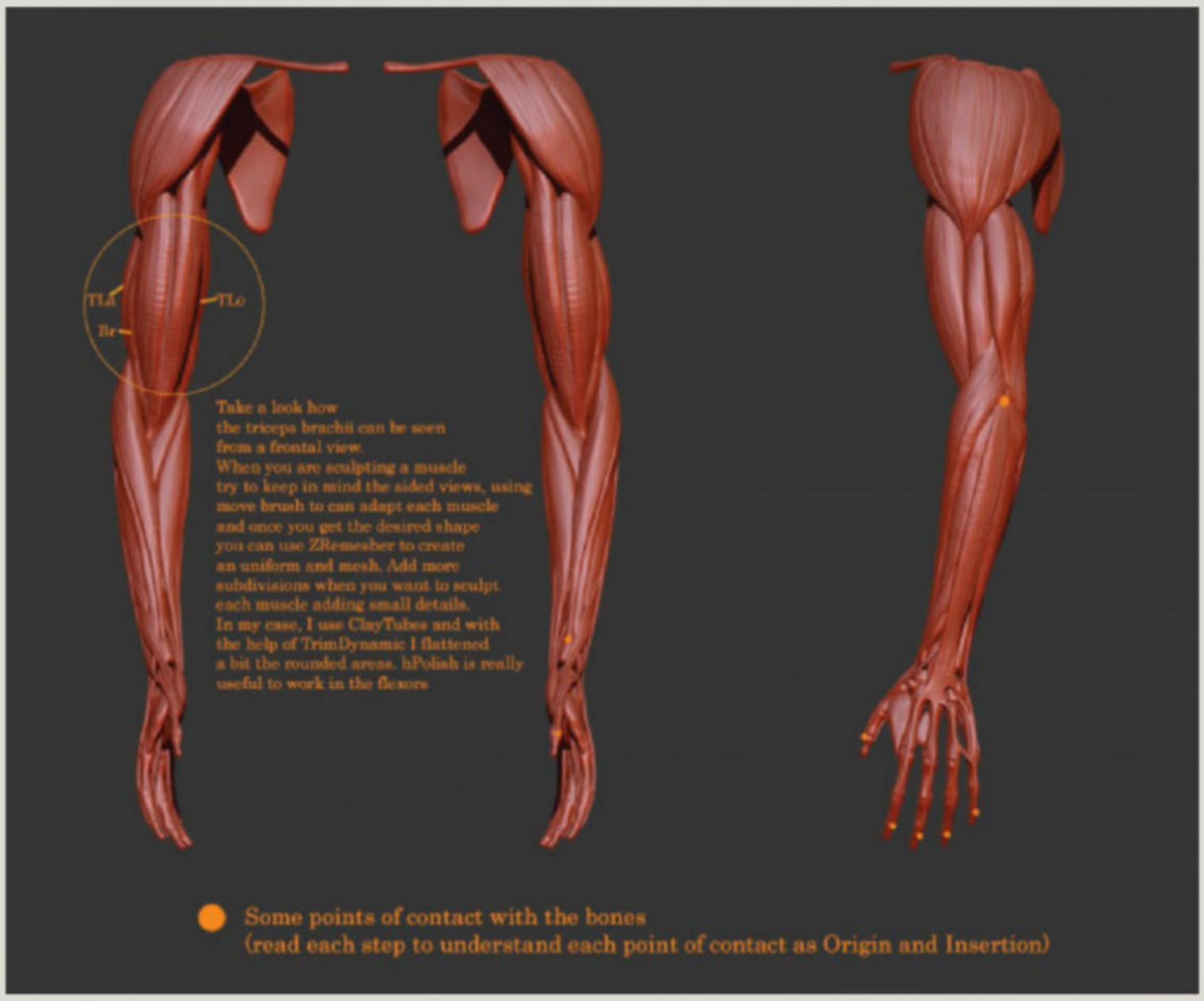
The forearm muscles are made up of the muscles from the elbow towards the wrist. These include the anconeus, extensor digitorum, extensor carpi ulnaris, extensor carpi radialis brevis, extensor carpi radialis longus and the brachioradialis. As well as these, nearer the wrist you'll find the abductor pollicis longus and extensor pollicis brevis and the extensor pollicis longus. Within the forearms there is also the flexor carpi radialis, flexor carpi ulnaris, flexor digitorum superficialis, flexor digitorum profundus, flexor pollicis longus, palmaris longus and the pronator teres.

Last of all, in the hand muscles you can find the first dorsal interosseous, adductor pollicis transverse head, abductor pollicis brevis, flexor pollicis brevis, abductor digiti minimi and the flexor digiti minimi brevis.

The structure of arm muscles is divided by a fascial layer, which separates the muscles into two osteofascial compartments. These are known as the posterior and anterior compartments. The anterior compartment of the arm is also known as the flexor, while the posterior compartment is also commonly known as the extensor compartment.

After this brief introduction to the muscles of the arm, it's important to bear in mind a few tips and tricks for the sculpting process. First of all, remember to look at books on human anatomy to familiarise yourself with anatomical terms and with the way that the muscles interact with one another. You should bear in mind the anterior and posterior views, as well as other angles, but also learn how each muscle moves and works around the bone.

By following these steps you should be able to develop a more-comprehensive idea of this aspect of sculpting muscles. The anatomy of the arm is pretty complex, and it's hard to explain in only a few steps, but try to do sketches on paper to clarify your ideas and to help you to understand the way these muscles work.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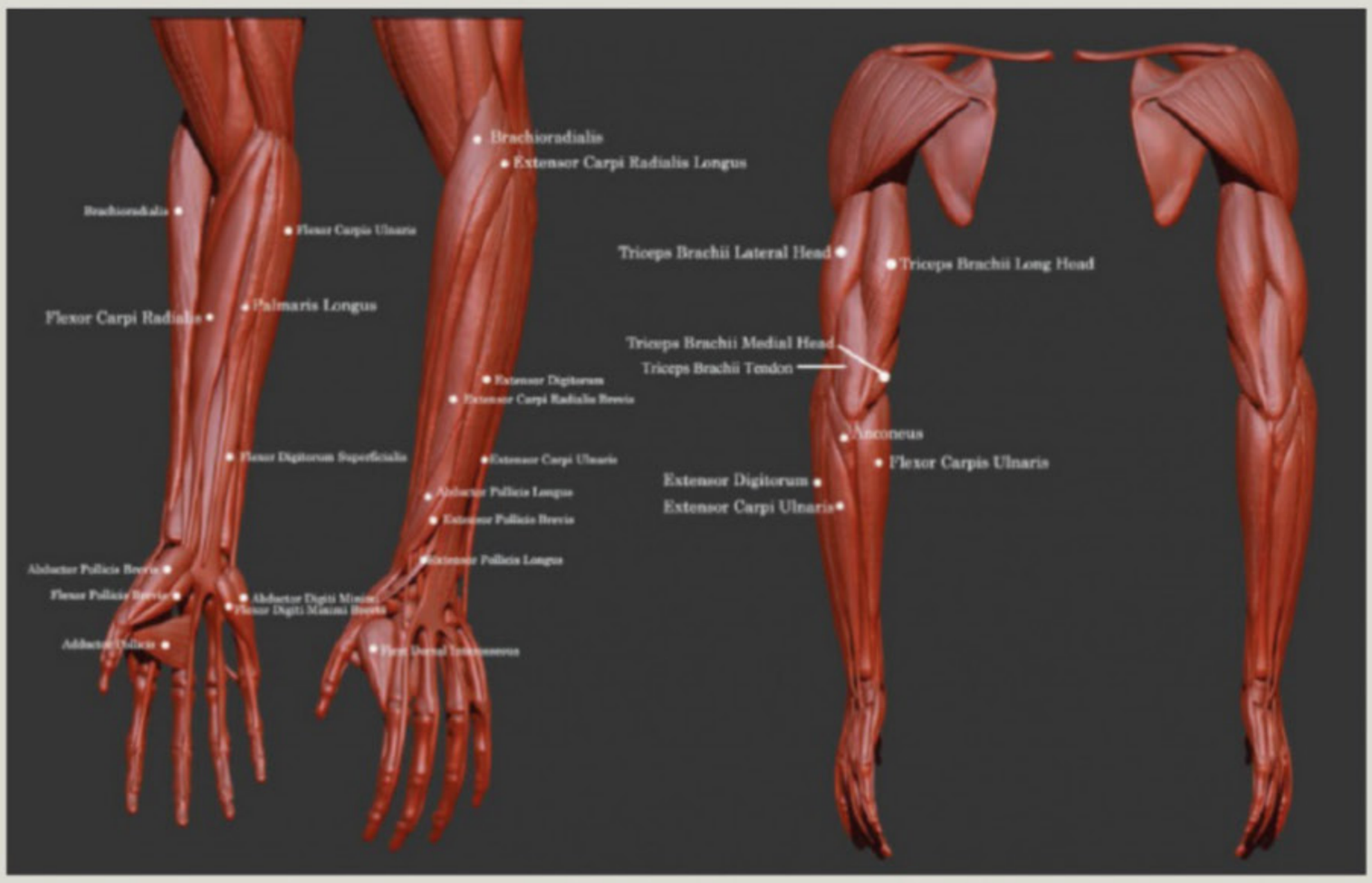
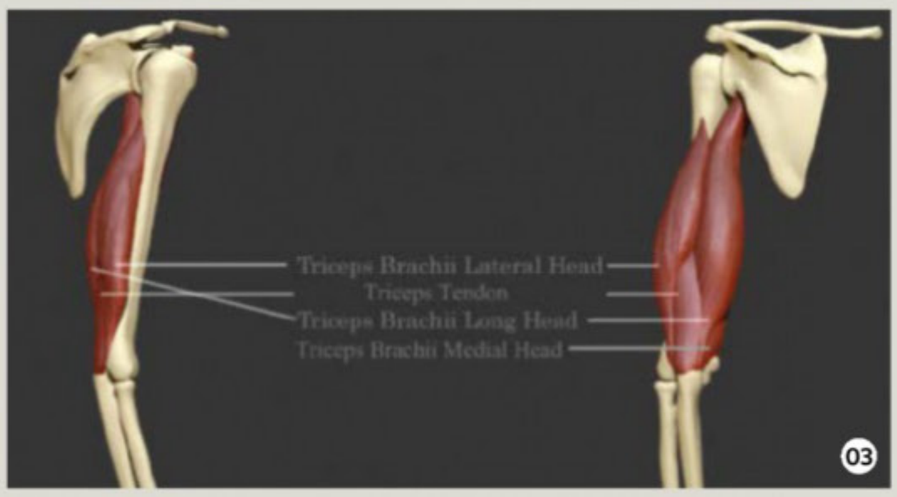
Br
Take a look how
the triceps brachii can be seen
from a frontal view.
When you are sculpting a muscle
try to keep in mind the sided views, using
move brush to can adapt each muscle
and once you get the desired shape
you can use ZRemesher to create
an uniform and mesh. Add more
subdivisions when you want to sculpt
each muscle adding small details.
In my case, I use ClayTubes and with
the help of TrimDynamic I flattened
a bit the rounded areas. hPolish is really
useful to work in the flexors
Some points of contact with the bones
(read each step to understand each point of contact as Origin and Insertion)





Take a look at how to sculpt the arm muscles

01 Brachialis and the biceps

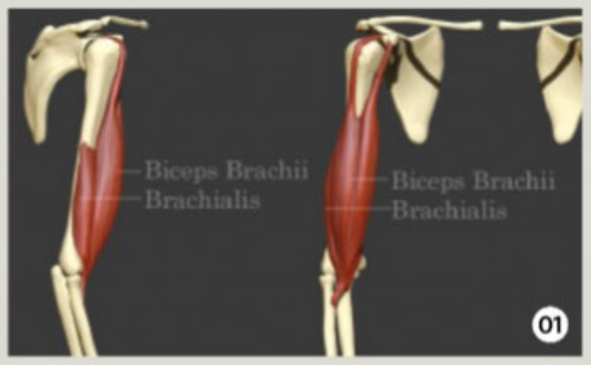
The origin of the brachialis muscle is located in the lower half of the anterior surface of the humerus. The insertion is in the coronoid process of the ulna. For the biceps the origin of long head is located in the supraglenoid, while the short head's origin is at the tip of the coracoid process of the scapula. The insertion of both is located at the radial tuberosity. It's important to note that the biceps don't actually have contact with the humerus, just an insertion in the radius.

02 Coracobrachialis

For the coracobrachialis muscle, the origin is located at the tip of the coracoid process of the scapula and the insertion is at the short vertical line that is halfway down the humerus, known as the medial humerus. It starts at the apex of the coracoid process as the short head of the biceps brachii.

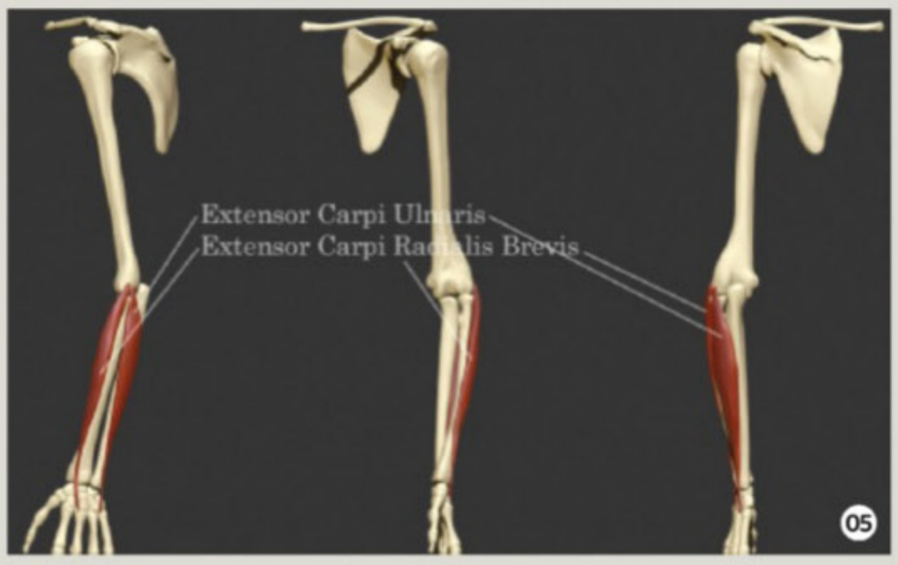
03 The triceps brachii muscle

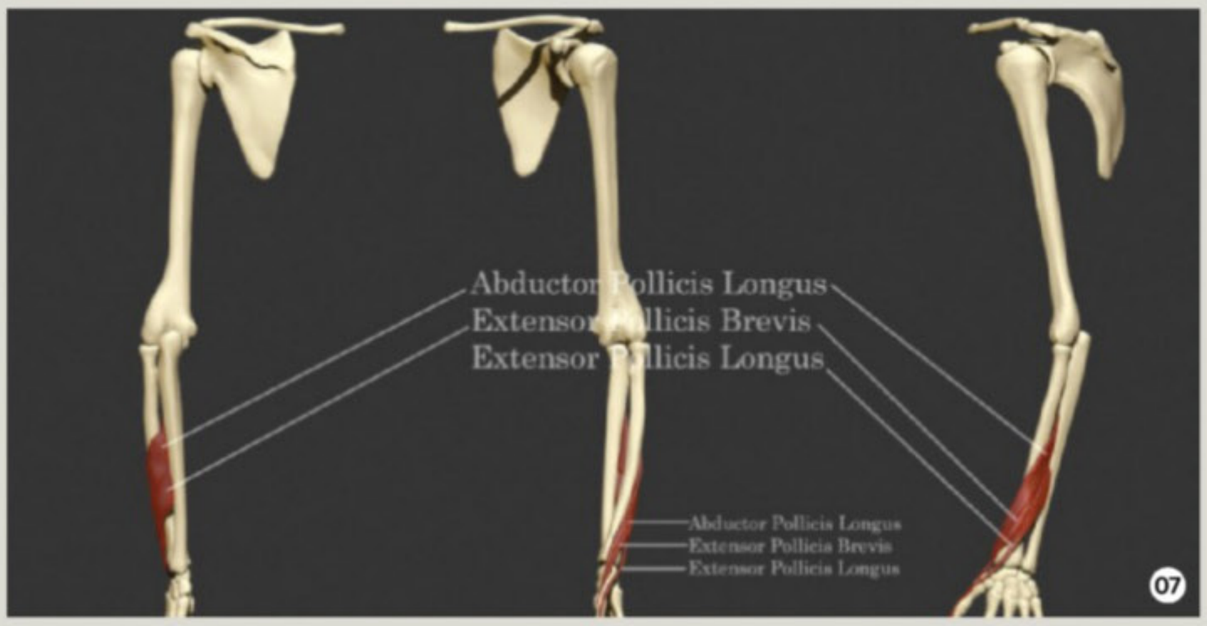
As the name suggests, there are three parts to the triceps. The triceps brachii lateral head's origin is above the radial sulcus, the long head's origin is at the infraglenoid tubercle of scapula, while the triceps brachii medial head origin is located below the radial sulcus. They all share the same insertion, which is located at the olecranon process of the ulna.

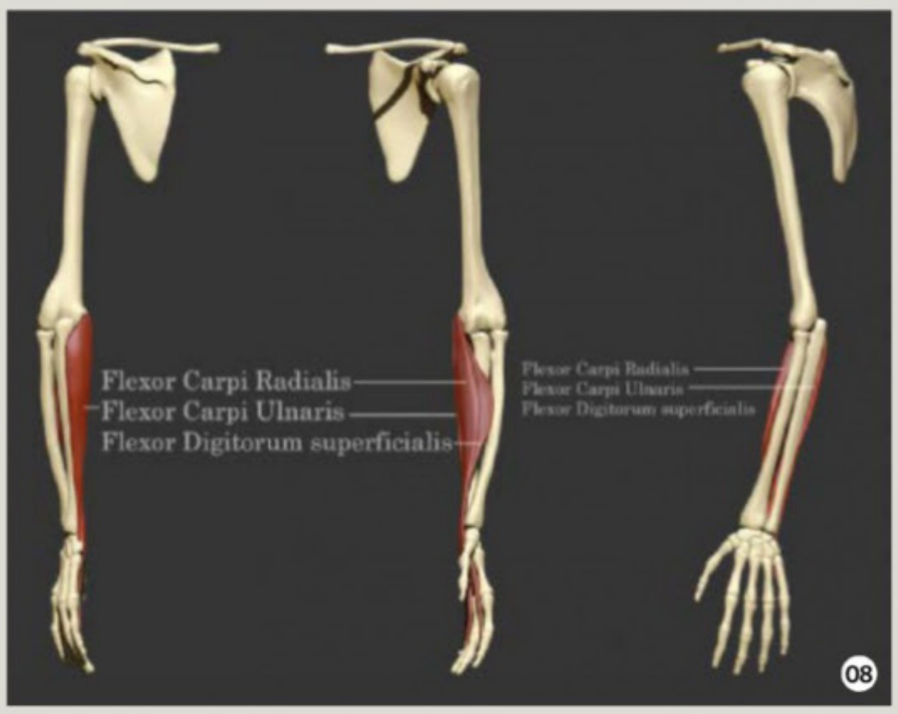


Create arm muscles

A good way of creating the arm muscles is by using InsertCylinder over a SubTool, such as a bone, which will create a new object in a separated PolyGroup. Using the Move brush, you can stretch and adapt each muscle. When you're sculpting you can use the Inflate, TrimDynamic and ClayBuildup brushes, following the origin and insertion of each muscle according to the steps. Once you have the desired shape, use ZRemesher to get a clean mesh and to eliminate the stretched polygons after having used the Move brush. You can also use ClayPolish to flatten the rounded shapes.







Anatomical body planes

Here is a brief summary about what different words mean. Anterior means in front, while posterior means behind. Similarly, superior means above, while interior means below. The coronal plane refers to any vertical plane that divides the body into anterior and posterior, and the transverse plane divides the body into superior and inferior parts, perpendicular to the spine. The sagittal plane is parallel to the medial plane. When using the word dorsal, it refers to an area near the upper surface, while the ventral is towards the bottom. Lateral indicates that something is near the side, while medial means that it's in the middle. These phrases are important to develop an understanding of anatomical directional, so it's important that you know them when you're learning about anatomy.

04 Anconeus and extensor digitorum muscles

The origin of the anconeus is located at the lateral epicondyle of the humerus proximally and the insertion is at the lateral surface of the oclecranon process and the superior part of the posterior ulna distally. The extensor digitirum's origin is located at the lateral epicondyle and the insertion is at the extensor expansion of the middle and distal phalanges of the second, third, fourth, and fifth fingers.

05 The ECU and the ECRB muscles

The extensor carpi ulnaris (ECU) origin is located at the lateral epicondyle of the humerus and the insertion can be found at the base of the fifth metacarpal. Similar to the ECU, the origin of the extensor carpi radialis brevis (ECRB) is located at the anterior of the lateral epicondyle of the humerus and the insertion can be spotted at the posterior base of the third metacarpal.

06 ECRL and brachioradialis

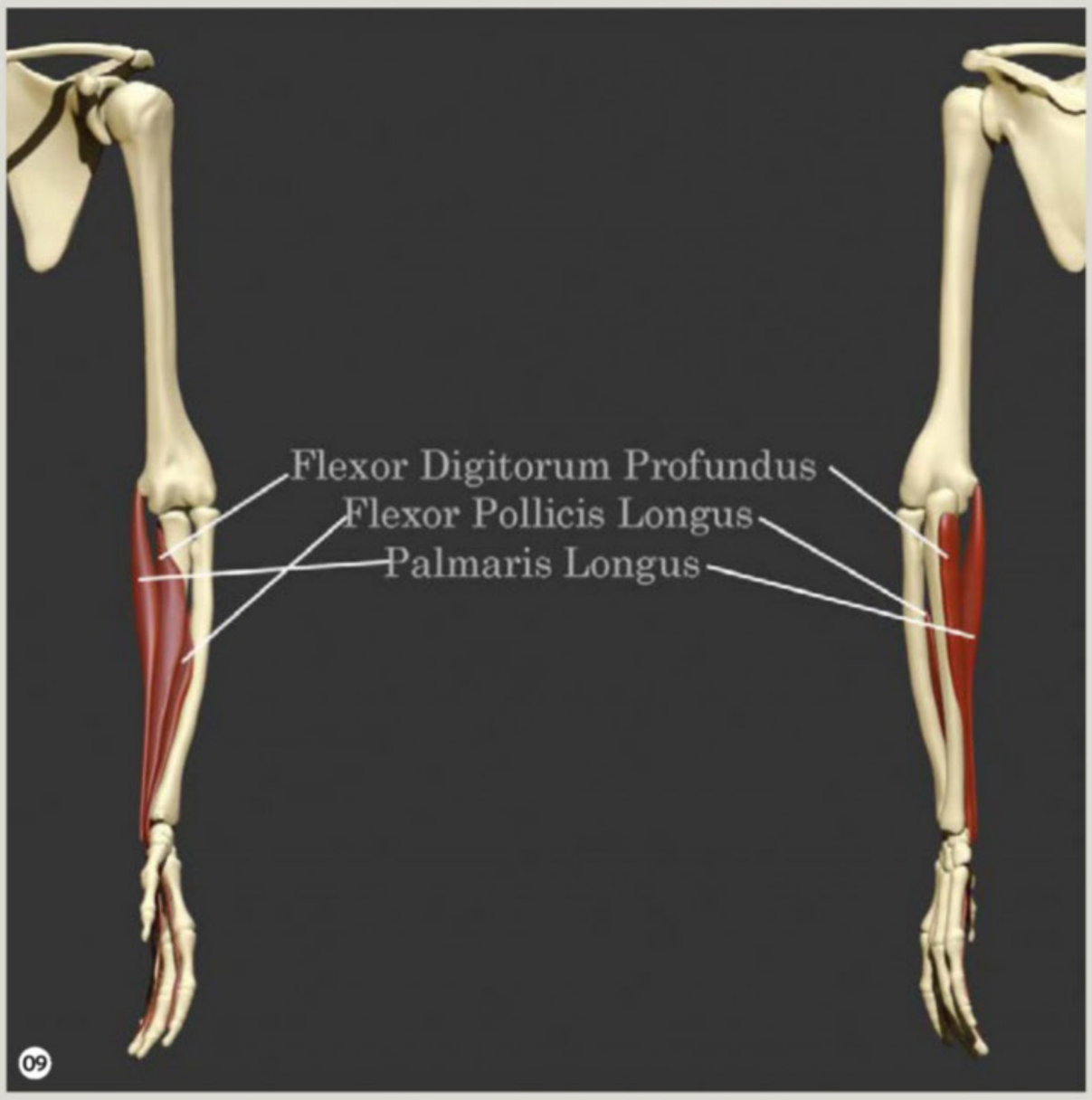
For the extensor carpi radialis longus (ECRL), you will find the origin located at the lateral supracondylar ridge and the insertion is located at the second metacarpal. The lateral supracondylar ridge is the lower part of the lateral border of the body of the humerus. The brachioradialis also originates at the lateral supracondylar ridge of the humerus, while the insertion is located at the distal radius.

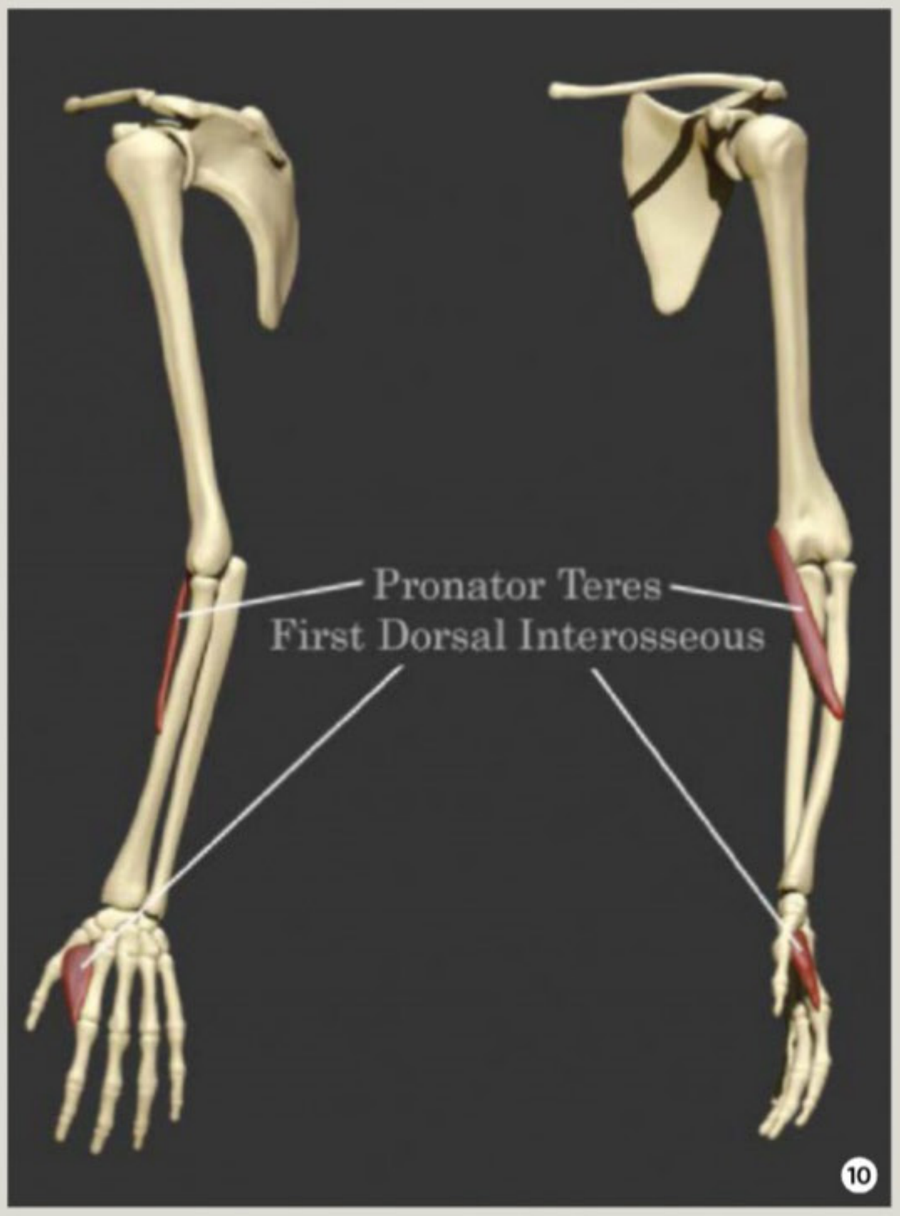
07 APL, EPB and EPL

The origin of the abductor pollicis longus (APL) is at the ulna, radius and the interosseous membrane, while the insertion is at the first metacarpal. For the extensor pollicis brevis (EPB), the origin is at the radius and the interosseous membrane and the insertion is at the thumb and the proximal phalanx. The extensor pollicis longus originates at the middle-third of the lateral part of the posterior surface of the ulna and the nearby area of the interosseous membrane and the insertion is the distal phalanx of the thumb.

08 FCR, FCU and FDS

For the flexor carpi radialis (FCR), the origin lies at the medial epicondyle of the humerus and the insertion is at the base of both the second and third metacarpal bones. The flexor carpi ulnaris (FCU) originates at the medial epicondyle and the medial margin on olecranon of ulna, with its insertion at the pisiform, the hook of the hamate and the base of the fifth metacarpal bone. The flexor digitorum superficialis (FDS) has an origin based at the medial epicondyle of the humerus and at parts of the radius and ulna. The insertion is at the edges of the palmar surfaces of the middle phalanges of the four fingers, but it has no attachment to the thumb.





09 FDP, FPL and PL

The origin of the flexor digitorum profundus (FDP) is at the ulna, from the middle third of its posterior border, the upper three-quarters of its medial surface, the interosseous membrane and the deep fascia of the forearm. The insertion is at the base of the distal phalanges of the fingers. The flexor pollicis longus (FPL) originates at the middle half of the anterior surface of the radius and the interosseous membrane, while the insertion is at the base of the distal phalanx of the thumb. Palmaris Longus originates at the medial epicondyle of the humerus and insertion is at the palmar aponeurosis.

Use ShadowBox and objects to create the arm muscles

Go to>Lightbox>Tool and add Shadowbox128. This will create a new tool. Go to the tool of the skeleton and using Insert, select Shadowbox128. Now, resize the ShadowBox, covering up the muscular area. Then, while you hold Cmd/Ctrl you can draw the muscle shapes using the front and sided views of ShadowBox. When you mask some areas of ShadowBox, this will develop the mesh according the painted co-ordinates.

10 Pronator teres and FDI

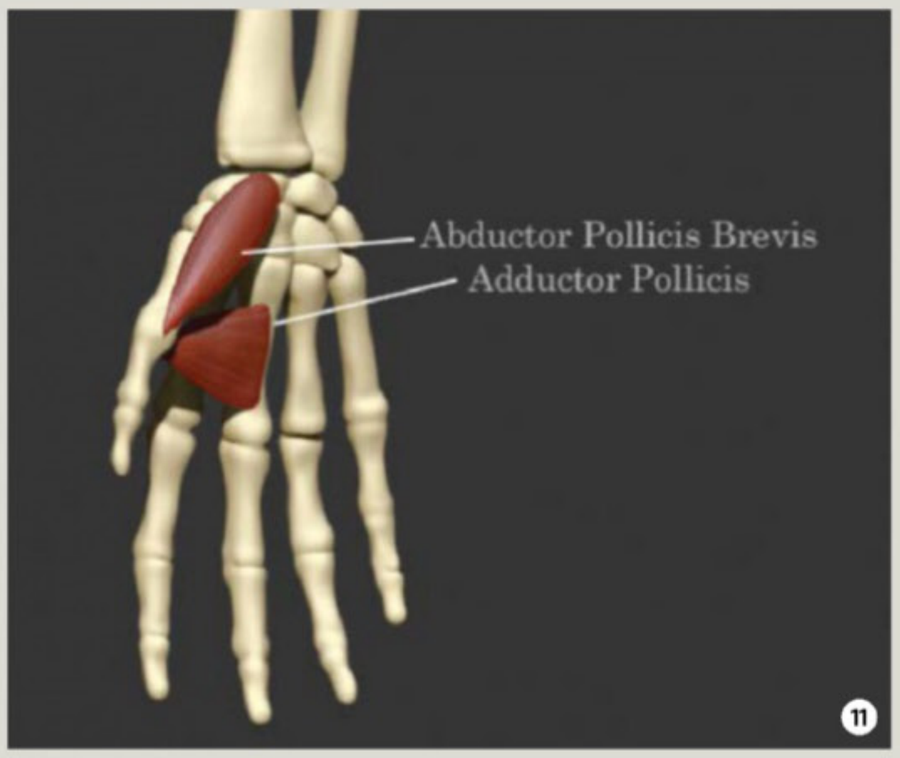
Pronator teres originates at the humeral head and the insertion is at the middle of the lateral surface of the body of the radius. The first dorsal interosseous (FDI) originates at the metacarpals, while the insertion is at the proximal phalanges, with a small attachment to the dorsal extensor aponeurosis of the index finger.

11 The thumb muscles

As one of the muscles of the thumb, the adductor pollicis originates at the distal two-thirds of the palmar surface of the metacarpal of the middle finger, while the insertion is at the ulnar side in the base of the proximal phalanx of the thumb. The abductor pollicis brevis has an origin at the transverse carpal ligament and the scaphoid and trapezium, with the insertion located at the radial base of the proximal phalanx of thumb and the thumb extensors.

12 FPB, ADM and FDMB

The origin of the flexor pollicis brevis is at the palmar surface of the trapezium, flexor retinaculum and the insertion at the radial and part of the palmar side of the base of the proximal phalanx of the thumb. The abductor digiti minimi originates at the pisiform, and the insertion is at the base of the proximal phalanx of the fifth digit on the ulnar or medial side. Last of all, the flexor digiti minimi brevis originates at the hamate bone, and the insertion can be found at the ulnar side of the base of the proximal phalanx of minimi.



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William Vaughan is the academic director at the DAVE School and has created digital art for a wide range of studios, including Nickelodeon and Pixar Animation Studios.

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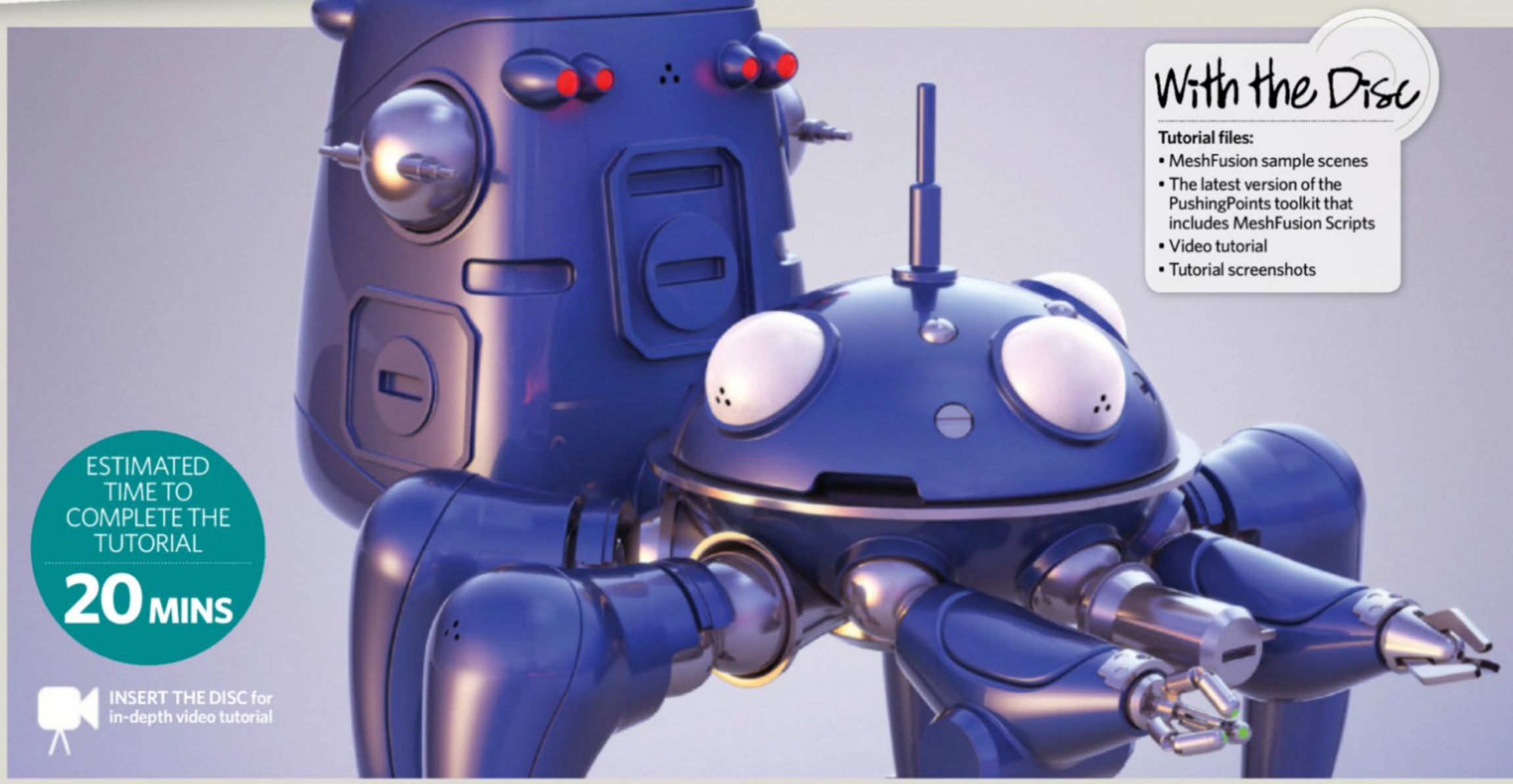
Currently lecturing at AIE Australia and with over 13 years of CG production experience, Dave has worked for some of the biggest studios. See his intro to Bifröst for Maya on p88.



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Create tertiary sci-fi detail

"How can I easily create sci-fi seam lines and panels with MeshFusion?"

When creating sci-fi-themed meshes, it's a good idea to make them appear to have been made the same way as real-world items. The best way to sell this is to create seam lines and panels throughout your mesh. Adding these details to the large surface areas of your mesh to make it appear more complex and manufactured is known in the industry as adding nurnies and greebles.

Ron Thornton coined the term nurnies, referring to CGI detail and the special effects artists working on *Star Wars* used the term greebles. These details can take otherwise boring meshes to the next level.

Working with MeshFusion in MODO makes light work of bringing these additions to your digital assets and in this tutorial I'll introduce you to this amazing toolset that will enable you to add panels and seam lines to your scenes.

MeshFusion provides two completely different ways of working with its tools, enabling you to use the toolkit in whichever way works best with your workflow. For artists just getting started with MeshFusion, I'd suggest using the 3D Tree option, which is a more-visual workflow. For more-advanced users looking to push MeshFusion to its limits, I'd suggest using the Schematic workflow, which makes use of MODO's Schematic workspace.

For this tutorial, I'm going to assume MeshFusion will be new to most readers, so we'll use the 3D Tree workflow. It's important to note that MeshFusion items that have been generated using the 3D Tree can easily be converted to a Schematic workflow but currently, a Schematic Fusion item cannot be converted to a 3D Tree.

There are a few MODO layouts that enable you to navigate the MeshFusion toolkit, but I recommend working with the Tabbed Fusion layout, which gives you quick access to the 3D Tree-friendly layout as well as the Schematic-friendly layout. Go to Layout>Layouts>Tabbed Fusion to load the custom MODO layout for MeshFusion. Since we'll be using the 3D Tree workflow in this tutorial, click on the Fusion Model tab.

When working with MeshFusion, all of your mesh items should be made up of 100% quad polygons and converted to Catmull-Clark Subdivision Surfaces. For this example, we'll take advantage of the preset meshes that ship with MeshFusion so that you can easily follow along.

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01 Create a base mesh item

MeshFusion ships with preset meshes called Qbics that are all quad-polygon, Catmull-Clark Subdivision Surface meshes, making them ideal for working with the MeshFusion toolset. Double-click on the second Qbic in the Preset browser named Q-Barrel 1 to add this to your scene. I chose this preset as a base mesh as it has curved surfaces that can pose challenges when adding panels or seam lines using traditional modelling tools on SubD meshes. Feel free to create a custom mesh item to use with this tutorial. Just make sure it's an all-quad mesh using Catmull-Clark Subdivision Surfaces for optimal results.

02 Add a panel

To add a panel to the base mesh, double-click on the Qbic named Q-SoftQube 1 from the Preset browser. Using the Transform Move tool (W), position the mesh item so that it intersects with the base mesh in a location that you'd like to place a panel. Try and pick a location that would make sense for a panel to be on a real-world item. It's important to keep in mind that when using MeshFusion, you don't have to commit to any decisions you make, since everything you do remains live and editable at any time.

03 Fuse the panel to the base mesh

We'll create a Fusion item to avoid the two meshes looking like they are simply crammed into each other. Select both mesh items and click the New Fusion button located on the top Menu bar. Select Union Of Meshes and the two items will be fused together. The 3D Tree located on the left is a visual representation of how the Fusion item is constructed. The two items are fed into the green dot that represents union. Take note of the fillet/chamfer edges where the two items meet. MeshFusion refers to these as Strips. This fine detail adds more realism to a mesh by catching highlights and defining the edge better.

04 Refine the panel shape

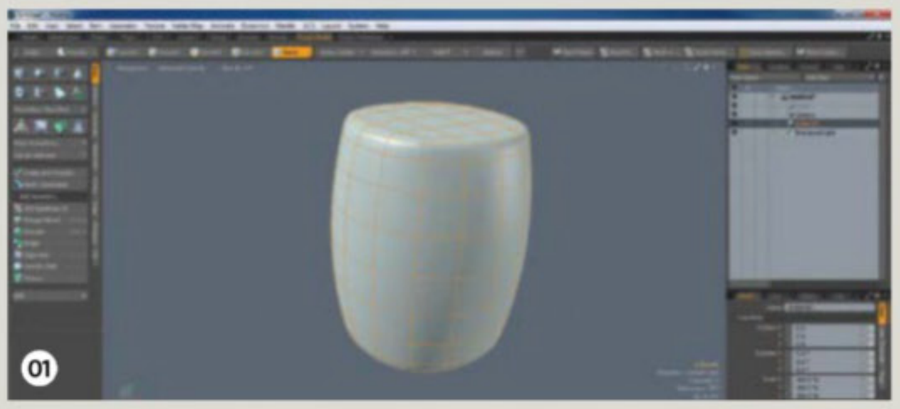
Now that the panel is fused to the base mesh, we need to make it look more like an actual panel. Create another mesh item by double-clicking on the Q-Barrel 1 Qbic. Scale the new item to 106.5% so it's slightly larger than the base mesh. Drag the new mesh to the small blue dot on the 3D Tree to add it to the Fusion Item. The blue dot represents an intersection and as you can see, the panel mesh is trimmed by the larger barrel mesh. Don't forget that all items are still live and can be edited. Feel free to change the scale of the larger barrel to adjust the thickness of the panel.

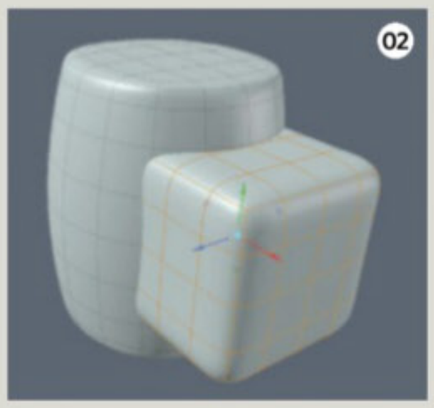
05 Add a seam line

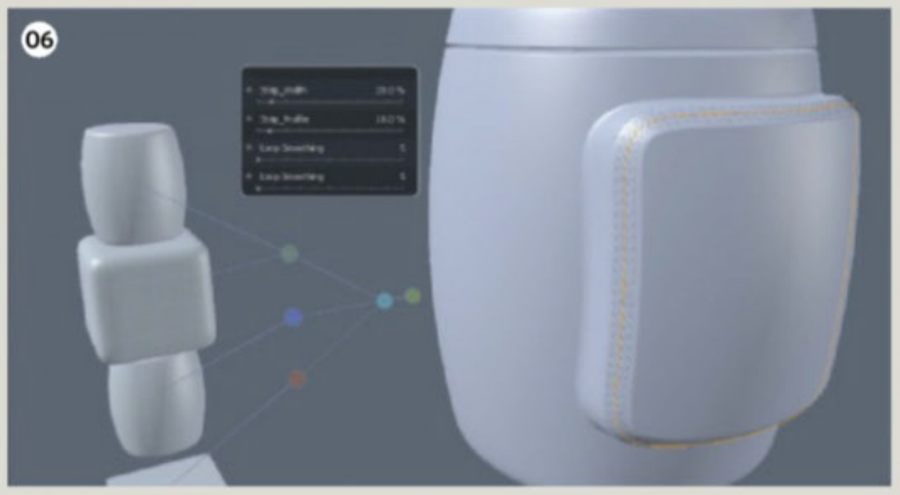
Now that we have a fused panel on our base mesh, let's add a seam line to the top to break up the large surface area and make it feel like this item is made up of multiple parts. Double-click on the Qbic entitled Q-ThinBoxSquare to add it to the scene. Scale it 200% in the X and Z and position it towards the top of the base mesh. Drag the thin box to the red dot on the 3D Tree to add it to the Fusion Item. The red dot represents subtraction and as you can see we've created a sharp seam line.

06 Adjust the MeshFusion Strips

To adjust the MeshFusion Strips we'll want to make sure we have access to all of them. To do this, click More Fusion>Fusion Strips>Update Strip Items. Click on any Strip you'd like to adjust and you will be presented with a few slider options, which include Strip_Width, Strip_Profile and Loop Smoothing. These options enable you to fine-tune the chamfers and bevels that make up your mesh. Using these four simple mesh items, we've created a panel and seam line in just a few minutes. That said, I could easily create the same mesh using several techniques without the use of MeshFusion. The real power of Mesh Fusion is the ability to make adjustments at any time, giving you ultimate creative freedom to not be locked into decisions made earlier. Spend a few minutes reconfiguring the elements that make up this Fusion Item to experience what makes MeshFusion a game-changer when modelling. Be sure to watch the MeshFusion video tutorial on the disc to discover more information about this exciting toolkit for MODO.







MeshFusion tips

- For optimal results, keep your mesh items 100% quad polygons.
- Keep your mesh items as low-poly as possible and use the Fusion SubDivs option to increase the mesh density.
- If you find yourself using the same mesh items frequently, add them to the Qbics directory for easy access.
- Convert your 3D Tree Fusion Items to Schematic to study how to build Schematic Fusion Items.
- If your source meshes are distracting or in the way, use the Mesh Vis button to toggle their visibility on and off.

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ESTIMATED TIME TO COMPLETE THE TUTORIAL **40 MINS**

An introduction to Bifrost in Maya 2015

"How can I use Maya to create an animation of wine pouring into a glass?"

INSERT THE DISC for in-depth video tutorial

If you had asked me the same question a few months ago, my answer would have been quite different. I would have stepped you through Maya's built-in fluid system and then shown you all of the tricks and cheats to get it looking acceptable. However, now that we live in a world where Maya 2015 has completely reimagined its fluid simulation system, there is really only one method I would recommend, and it's called Bifrost.

Originally developed by Exotic Matter and using Naiad technology, Bifrost is a procedural engine, capable of generating liquid simulations. Based on a FLIP (Fluid Implicit Particle) solver, Bifrost can generate liquid from emitters, which then react to gravity and also be directed using colliders and accelerators.

Although fully integrated into Maya, the simulation calculations are actually handled externally by the Bifrost Computational Server. Using Viewport 2.0, this enables you to author, refine, playback and scrub within Maya, all while the simulation is actually being processed in the background. Such interaction is crucial to bringing a greater level of creativity and control, while still providing a very high degree of efficiency.

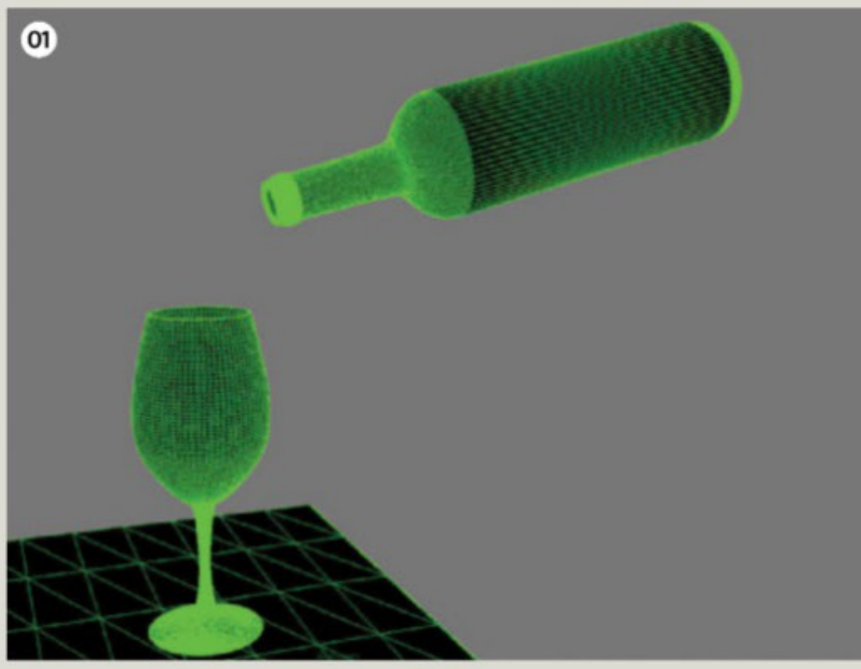
Over the following steps I'll introduce you to the Bifrost system and show how to get a basic simulation up and running. I will step you through the process using a simple scene involving pouring wine from a bottle into a glass. It's important to note that even though we are using a simple scenario to go through the procedure, the same steps can be applied to much larger simulations, such as on pools, waterfalls, rivers and oceans, to name just a few.

Our aim is to replicate the effect of filling a wine glass with liquid from a wine bottle and to have the liquid react naturally to the various objects within the scene. For the purposes of generating a final render, we also want the materials to replicate an actual liquid. To achieve this goal, we'll create a simple geometry emitter to represent the wine coming out of the bottle. We'll set both the bottle and the glass as collision objects, so the liquid will react to these objects correctly. We will also set up a Kill-Plane to increase the efficiency of the solve.

Once we are happy with the simulation, we'll bake out the information to a cache sequence and create a liquid mesh object, using the baked data. This mesh can then be textured, using the Bifrost material for the final render.

01 Prepare the scene

It is important to set the scene up correctly before starting the simulation process. This means animating any objects that need animation and correctly positioning everything in the scene. It's also important to get the scale right. Bifrost works exclusively in metres, regardless of the scale units currently set in Maya. For example, if you have a cube 100 units high and your Maya units are set to centimetres, Bifrost will treat the object as 100 metres high. This is a critical element to remember, as any simulation will not look right if the scale is not correctly planned out.



02 Create the Bifrost simulation objects

Let's start by creating the emitter object. We will use a simple polygon cylinder carefully placed in the neck of the bottle. Scale it so there is clearance around the emitter and is not penetrating into the bottle's geometry. With the emitter selected, go to the Bifrost menu and select Create Liquid. This will produce all of the required Bifrost objects, which include Bifrost1, BifrostLiquid1 and BifrostMesh1. You'll also notice the additional controls added to the emitter's shape node, under the new section entitled Bifrost. In fact, any object used as an emitter, collider or accelerator, is given extra Bifrost controls.

03 Make the collision objects

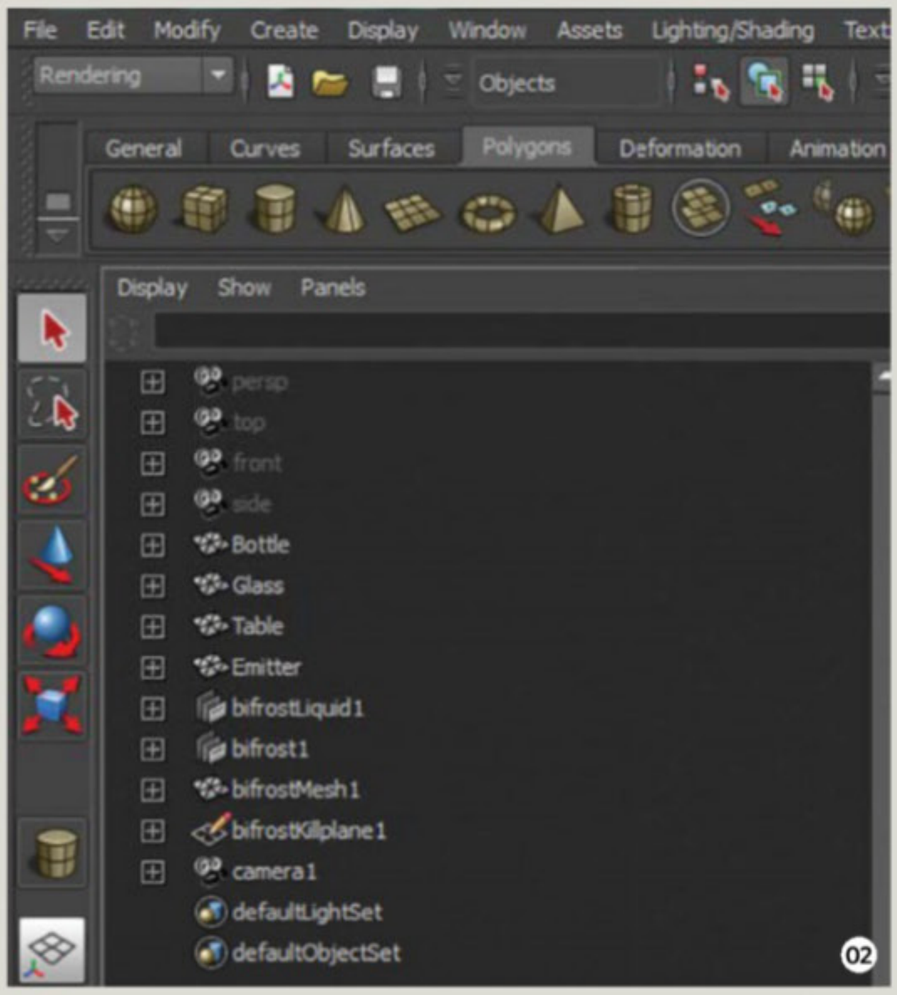
Using the Outliner, select Bifrost1 and click the timeline's play button. You should see a growing yellow bar appear on the timeline, with a green bar growing slightly behind it. This indicates that the simulation is processing. You should also see the particles are dropping straight through the bottle. We need to turn the bottle into a collision object. Select the Bifrost1 object, then Shift-select the bottle and choose Add Collider in the Bifrost menu. Now when you press play the bottle will deflect the particles. Do the same for the glass.

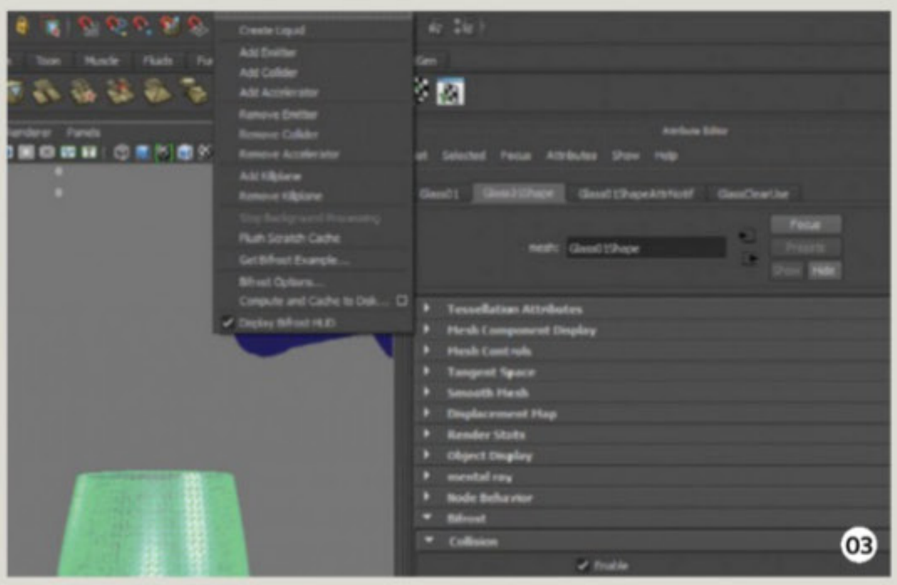
04 Refine the simulation

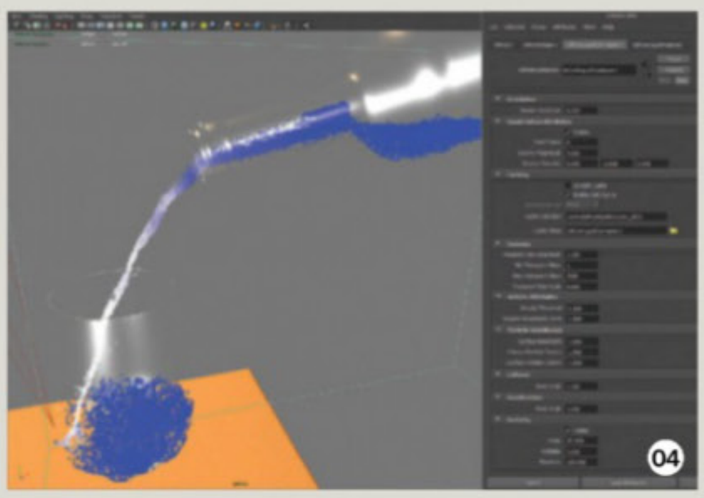
The most important setting is the Master Voxel Size, located at the top of Bifrost1's BifrostLiquidContainer1 panel. This parameter sets the size of the voxels in metres scale. For our wine glass simulation we need to be working in centimetres, so set it to 0.005. This means the voxels are 5cm in size and will create a more-realistic simulation. As well as this, it will increase the simulation processing time, but it's the price we pay for accuracy. We also want to decrease the Transport Time Scale to 0.75. This provides a more-stylistic look by slowing down the simulation time.

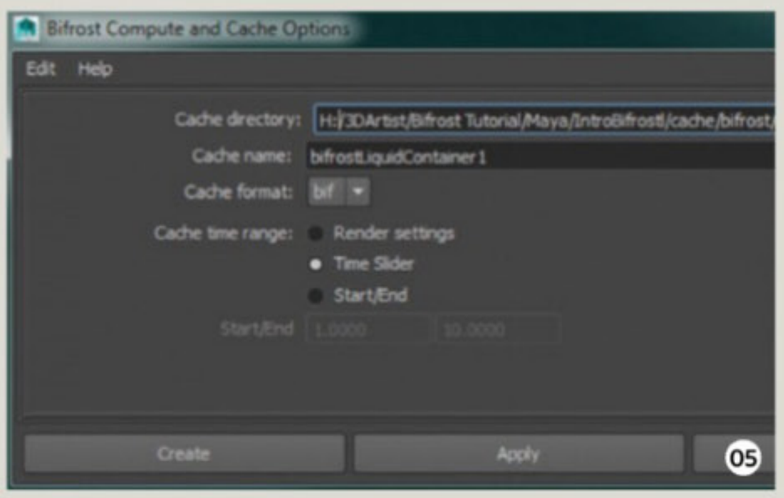
05 Bake out the cache

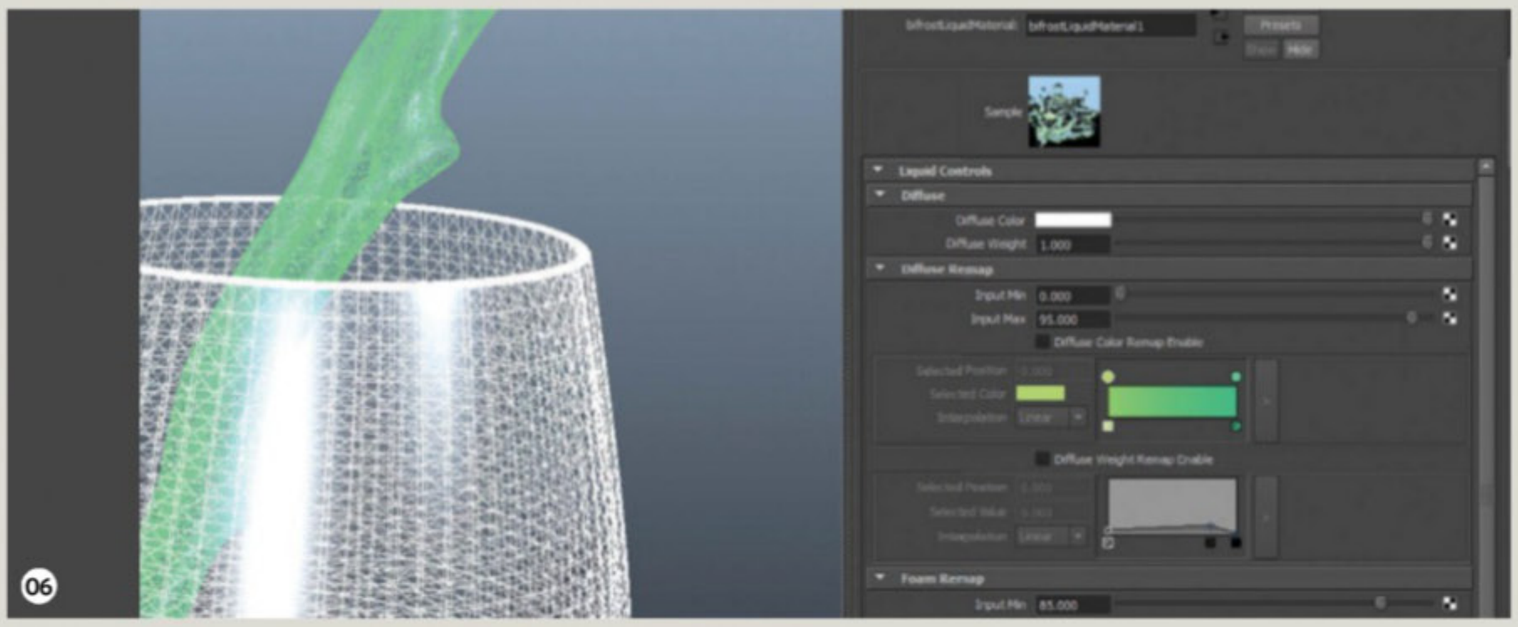
Now that we're happy with our result, let's bake out the cache data to save having to process the simulation every time. This will also make the process of creating a mesh much more responsive. Simply go up to the Bifrost menu and select Bifrost Compute And Cache Options. Set the output location and cache name, then click the Create button. This will create a file sequence, which contains the simulation data. Once processed, select Bifrost1 and go to the Caching section. Tick the Enable Disk Cache option and ensure the cache path is correct.











06 Make a simple mesh and material

Select the Bifrost1 object and tick the Enable setting in the Bifrost Meshing options. You should now have a mesh representation of the simulation. Tweak the settings for the mesh until you're happy with the geometry, then hide the Bifrost1 object. Notice that the mesh is still visible. You are actually seeing the BifrostMesh1 object, which already has a material applied. Head over to the BifrostLiquidMaterial1 tab and adjust the settings to suit your desired effect. Try disabling the Foam Remap controls, as the simulation's timing is quite slow and would not have a great deal of foam.

Five tips for better Bifrost simulations

Scale it Making sure that you use the correct scale in your scene is imperative to getting a good simulation.

RAM it In the Bifrost Options, set the Maximum RAM Usage to an amount that is appropriate to your system to ensure that it works well.

Avoid it To avoid crashing and undesirable results, try not animate any of the BifrostLiquidContainer attributes.

Fill it Fill a pool or emit a single drop by turning off Continuous Emission in the emitter's Bifrost settings.

Kill it Adding a Kill-Plane to the scene will eliminate unwanted particles from the simulation, saving valuable simulation computations.

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Blow bubbles using V-Ray Metaballs

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“How can I simulate a bubble-blowing effect using V-Ray and 3ds Max?”

Simulating liquid behaviour in 3D applications can be a complex task and usually requires external plug-ins. These plug-ins are typically full of advanced controls for simulation that at first glance can be daunting. However, for more-simple simulations, V-Ray Metaballs is a great alternative, as you can get satisfactory results in relatively little setup time. It is very well integrated into 3ds Max and is supported by particle systems and forces that can be used together to generate a realistic simulation.

As part of V-Ray 3.0, Metaballs are available via a simple user interface found under the Create menu. Metaballs are geometric shapes that interact with one another, depending on threshold values set via the various parameters. As an example, two shapes can be pulled together to form a new isosurface. If you repeat this over a much larger simulation, you will start to form a type of blobby liquid. The Size and Smoothness parameters impact on the final result to allow you to create things, such as soap bubbles, as explained in this tutorial.

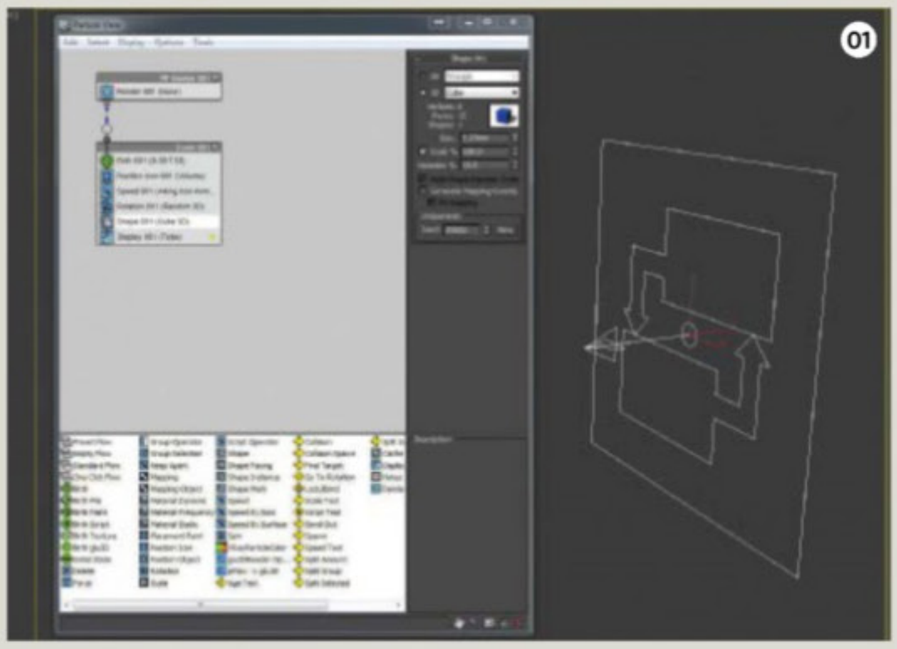
You can also use Metaballs to create cellular-type structures and you can use textures to modify the look of the Metaballs and create a much rougher surface. Metaballs are seen in the viewport along with the particle system so you can easily see how it affects the movement of the Metaballs. You also can get a good idea of what the end result will look like without experiencing any viewport lag or high-memory consumption, as the complete isosurface is calculated at render time.

In conjunction with 3ds Max's particles system, you have full control over speed, direction and obstruction. In this tutorial, Metaballs spawn from a source at speed and as they travel, they break apart forming perfectly round bubbles that drift delicately through the air.

The final touch will be the material and understanding how a bubble should look. As bubbles typically show a colourful, oily effect – much like a rainbow due to how the inner and outer walls interfere with each other – you will learn how to create this effect using a V-Ray material. You will also set up the Reflection and Refraction values to determine how the bubbles interact within an HDRI environment.

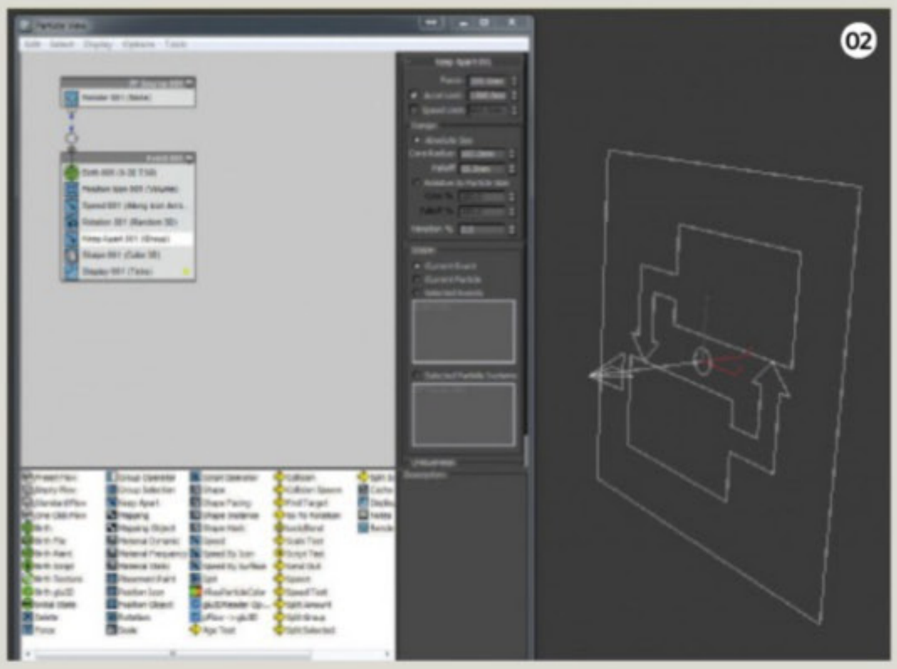
01 Set up particle emission

Go to the Create panel. Under Particle Systems, drag a PF Source into the 3ds Max viewport and set the size to 10mm by 10mm. Bubbles will spawn from the entire surface area. Open the Particle View and in the Render Parameter set the Type to None, as you will be rendering Metaballs and not particles. In the first Event, click Birth and set the Amount to 50. Select Speed and set it to 200mm. Click Shape and set the Size to 1.27mm – however this is not a true reflection of the size of bubble, as later on you will see how Metaballs parameters also affect size. Enable Scale and set the Variation to 15% so that you achieve a varying range of bubble sizes.



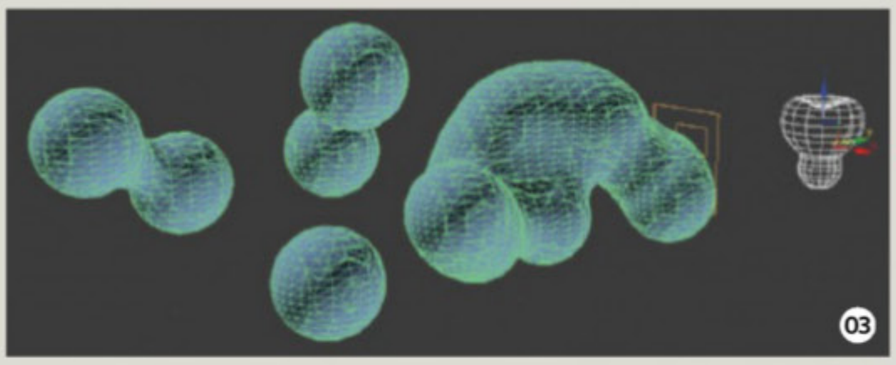
02 Control acceleration and distance

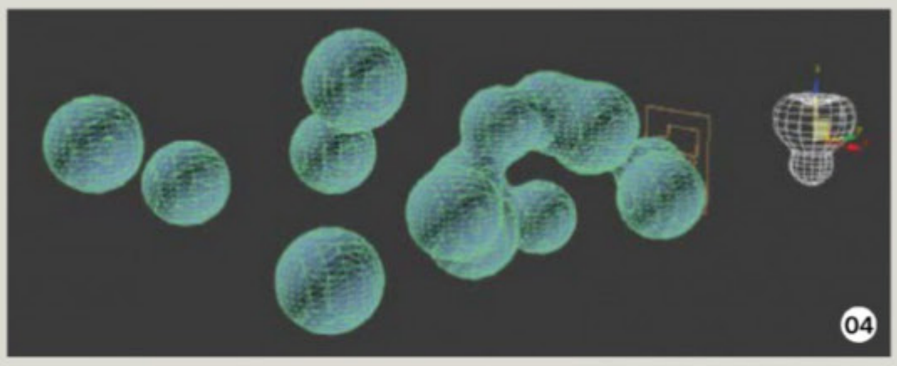
In Particle View at the bottom there are various operators, tests and flows that affect the particle behaviour. Click and drag a Keep Apart operator and position it between Rotation and Shape. This particular operator applies a force to the particles that affects how they separate by controlling Speed and Acceleration. The bubbles will spawn as a large isosurface and then start to separate, much like what occurs when blowing bubbles. To spread the particles apart, increase the Core Radius to 100mm. Increase the Acceleration Limit to 1,500mm so that particles spread out quite quickly after they spawn.

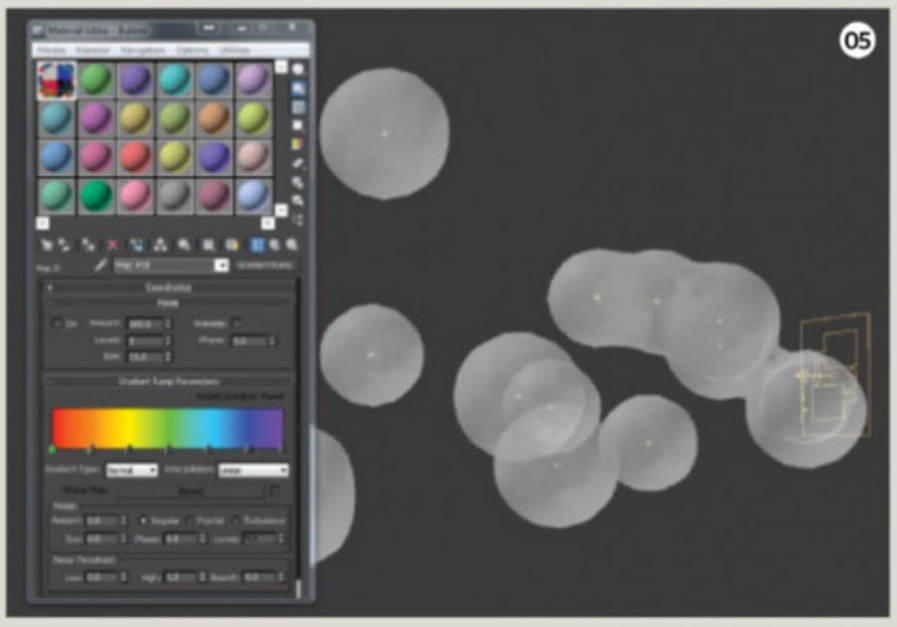


03 Link Metaballs with the particles

In the Create panel, go to the V-Ray dropdown list and add a VRayMetaball object to the scene. Under Positive Particles add the PF source. There is also an option to add Negative particles that work against the Metaballs. This is useful if you wish to obstruct Positive particles with Negative ones. Tick Use Particle Size to disable so that in Particle View you have full control of the size as well as the variable scaling. Under Preview, enable Use and Shaded, then set the Display Resolution to 50 to improve viewport display.







Metaballs viewport display quality

The Display parameter will enable you to see a majority of the Metaballs in the viewport. However, higher numbers will be a more-accurate representation, but will also slow down viewport performance. As Metaballs spread further away from the source, you may see them disappear in the viewport, but don't worry – they are still there, this is just due to the display resolution. You could increase the resolution temporarily to see a more-accurate result, but avoid scrubbing the timeline, as it may take a while to update.

04 Define the behaviour

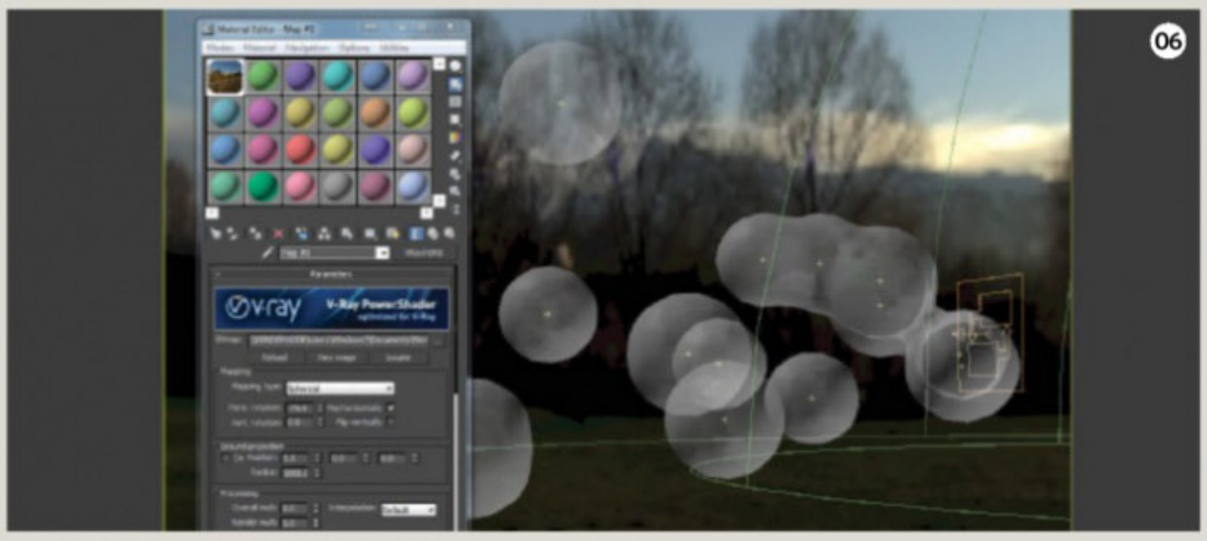
Lower the Threshold to 0.2 – higher values will reduce the size of the bubbles, as the surrounding particles will force them to become smaller. The Step Length can be left at the default value of 1.0 as the isosurface for the bubble is quite simple, but for more-complex fluids you may wish to lower this value. Note that lower values will increase render times considerably, but it is unavoidable if artefacts start to appear in the render. Enable Smooth Field Bumps and set the Radius to 9 and the Smooth Expansion to 1.0. This will remove any stray particles and smooth out the majority to form perfect bubble-shaped spheres.

05 Make the bubble material

Start with a V-Ray material and set both the Reflection and Refraction to pure white. Untick Fresnel Reflections, as you will control this via the Falloff map. Set the Refractive IOR to 1.001. In the Reflection, add a Falloff map, set the Type to Fresnel and set the Override IOR to 4. In the Outer slot, add a Gradient Ramp and set the Type to Normal so that it is affected by the camera angle. In the Ramp, Ctrl/right-click and choose Load Gradient. Locate and select the Rainbow Gradient.dgr file from the files supplied with this tutorial.

06 Add HDRI lighting

Add a V-Ray light, set the Type to Dome and increase the Multiplier to 30. Tick Spherical (full dome) and increase the Subdivisions to 128. Add an HDRI to the Texture slot and create an instance over to the Material Editor. Find the FeldBergheim2_small.hdr from the support files and set the Mapping Type to Spherical. Then lower the Inverse Gamma to 0.7 to boost contrast. Instance the HDRI to the environment and set it as the Viewport Background. Add a V-Ray Physical Camera and adjust the position and the exposure to suit. Enable DOF and set the White Balance to Neutral. When setting up the V-Ray Render settings take into consideration any DOF as it will require higher AA settings.



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Maya

Quickly block out 3D scenes

"How can I quickly block out a 3D environment in Maya while maintaining a strong composition?"

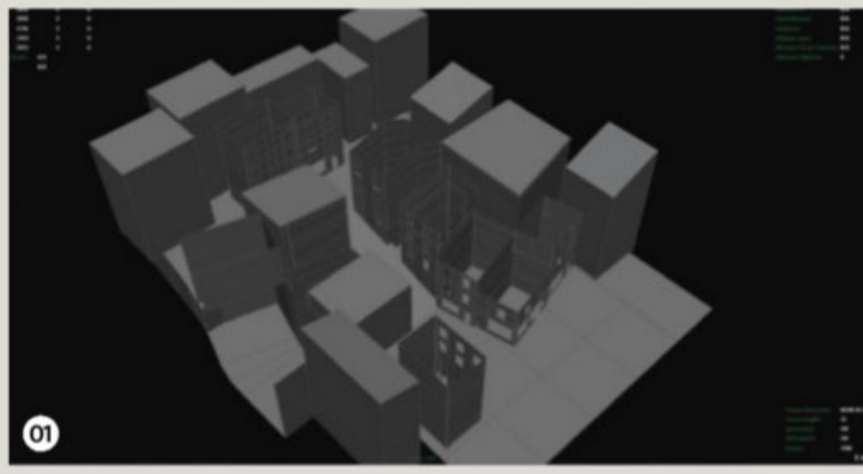
Everybody has their own preferred way of doing things. Like everything else in CG, there is always more than one way to do any one thing. In this tutorial we're going to go over how to quickly block out a digital set in 3D using Maya, walking through the workflow that I like to use.

The first thing to do when starting any project is to gather together a series of reference images that you can refer to as you work. If you make sure that you have a fairly clear idea of how you want things to look, it will come in handy, so keep researching and finding reference.

As you block out, keep in mind that staying as simple as possible helps you to get further along at a faster pace. We will begin by roughing in our block-out with basic shapes that will be the groundwork for our project. Having an understanding of where you are trying to go with your project beforehand is always helpful, which is why I stress the importance of gathering reference or going off of your own concept. A lot of the time, finding your way conceptually right in 3D can be fortuitous as well.

Having a strong block-out as your foundation is crucial to executing a large 3D environment. Working loosely and simply will help with making quick changes before your geometry gets too heavy and complex. We will establish a clearly defined path and area to focus on like a hero piece, which will be the main focal point of the scene. This is where you want to lead your audience's attention. From there, we will need to set up a render camera and its focus point. Once this is set, it's important to lock its translations in the Attributes menu so that it won't be accidently moved.

While continuing to work, we will focus on the importance of silhouette, form and asymmetry to help add interest and to create a solid composition. We will go over the usefulness of kitbashing and how it can add a high amount of detail to your scene quickly. As your scene grows, it is important to keep your outliner as organised as possible. We will also go over using mental ray and the Sun and Sky system to set up basic lighting. Building off of these principles will set the stage for our digital set to come together.


01

01 Initial block-out

When starting on roughing out the basic geometry for your scene, drop in a simple ground plane. Scale it until we have the coverage we need for our work area, as this will help to have a general concept or reference images to follow along with as we work. As we begin, keep everything simple so the geometry is easy to change, move and adjust. Create some basic shapes that represent the shapes of our idea and start populating them around the ground plane. This initial block-out will work as a sort of blueprint to build upon. All we are going for here are representative shapes and forms in varying sizes to make up your scene.

02 Establish the focal point

Here we want to look over what we have in front of us so far and determine where we want the focal point of our scene to be. Establishing the focal point of our scene will pave the way for moving forward, and this will be the concentration of most of our major detail work as we progress. For this particular project, I chose the café at the front as my focal point and added extra details, such as an interior, individual roof slates, shutters, set dressing and flora.

03 Set up the camera

Let's create a new camera in our scene so we can find the shot for our final render. It's important to create a dedicated camera that is separate from our regular perspective camera, so we can switch between the two as we work. The goal here is to find an interesting view of the focal point and establish how we want our audience to view the digital set. Move around the scene to get a feel for different views and try to find a shot that evokes a mood, tells a story, or simply looks good. When we have found a view that we're happy with, make sure to lock the camera.

04 Add silhouette and form

Now that we have a basic block-out, a focal point and a camera locked down, it's time to move forward by adding more geometry into our block-out. This can consist of anything necessary to break up the previously placed forms in our scene. Using reference to pull from real-world details can significantly help any project. It is best to concentrate on creating a solid form, a strong silhouette and adding asymmetry. We should also to be mindful of geometry placement and how it is adding to our scene. Playing with positive and negative space can also add interest and strengthen the composition in various ways.

05 Kitbash and instance

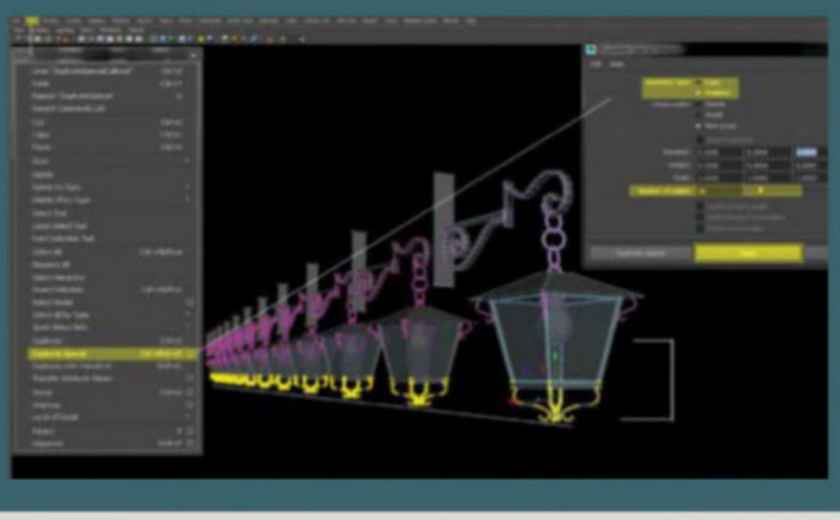
While progressing through our block-out, one of the most efficient practices we can utilise is kitbashing and instancing. If you have a small kit of models, you can easily dupe, translate, scale and rotate them around to fill up your scene quickly. Instancing can be a great time-saver when changes need to be made. If you have a model that will be all over your scene, it may be beneficial to have the original model and then duplicate instances of it around the environment. Any changes done to the original will update across the board. In this scene, for example, I began with a small kit of four to five different-looking plants to populate the environment.

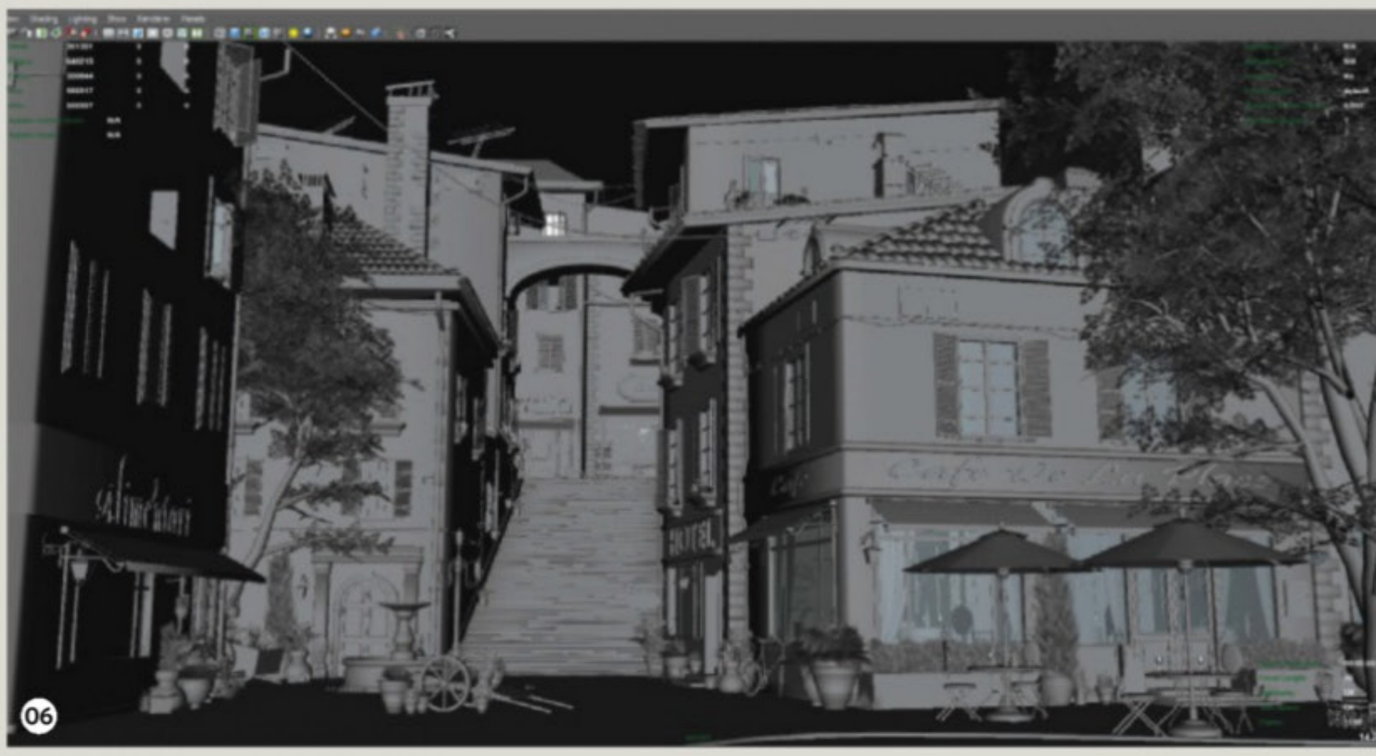
06 Finalise the composition

Now that our block-out is almost finished, it's time to tighten up the composition. This is where we want to go back to our final camera setup, check how our scene is coming together and how it can be improved. Adding details always brings life to any scene, but we must be aware of where and why we're adding it to avoid unnecessary tangents that could become an eyesore. It is also a good opportunity to use mental ray and the Sun and Sky system to block out major light and shadow areas in order to get a better feel for the space. We want to lead the viewer's eye towards the focal point and around the scene.

Instancing assets

If you have a single asset in your scene that you know you are going to reuse quite a bit, instancing can save you a lot of valuable time. You are also able to make changes to all of your instances at once, which can help speed things along. In order to do this, go to Edit>Duplicate Special>Option Box. Under your Geometry Type in Options, select the Instance button. Below your Transforms you can enter the desired number of copies needed. Click Apply, and you're done. Now any changes done to the original will affect all of your copies.





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Samurai
Hasan Bajramovic

Technique focus

Incredible 3D artists take us behind their artwork

BACKGROUNDS The idea of this image was to show the mountains in the back, but to diffuse the atmosphere. An important element was to create a good depth pass. I rendered three different depth passes: one that would highlight the foreground, a second one that would be more distant and finally a third one for the mountains in the back. **The Noble Qur'ran Oasis,** 2014

Christopher Malheiros

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Country France and Portugal

Software used
CINEMA 4D

Scan Computers 3XS GW-HTX35

An ultra-high-end workstation with dual Intel Xeon processors and a powerful Nvidia Quadro K6000 graphics card

REVIEW BY Orestis Bastounis, technology writer, UK

A few months ago, Scan sent us the 3XS GW-HTX30, a workstation that delivered superb overall performance. It may seem like déjà vu to see the GW-HTX35 then, since in many ways the system is identical. It's again based on a pair of eight-core 3.4GHz Intel Xeon E5-2687W processors, with 64GB of 1,600MHz Hynix ECC DDR3 memory, placed in an Asus Z9PE-D8 WS dual-socket motherboard. It even looks almost identical too, as it similarly comes in a truly massive Fractal Design Define XL housing case.

There is a crucial difference, however. The GW-HTX35 is fitted with a PNY Quadro K6000 graphics card, Nvidia's most-powerful GPU for 3D design applications. It's a massive upgrade from the already powerful K5000 that was used in the GW-HTX30.

The K6000 has been around for a while now, since it's based on Nvidia's mature Kepler graphics hardware platform, but it is still the most-powerful and power-hungry card Nvidia sells. It has 12GB of ECC memory and a total of 2,880 shaders, or CUDA processing cores, as Nvidia calls them. The 384-bit memory bus allows for 288 GB/s of memory bandwidth.

In comparison, the K5000 only has 4GB of video memory, a potential bottleneck on truly massive 3D environments. The K5000 has 1,536 shaders and a 256-bit memory bus, which delivers 173 GB/s of bandwidth. On paper, you roughly get between 50 and 75 per cent more graphics hardware with the K6000.

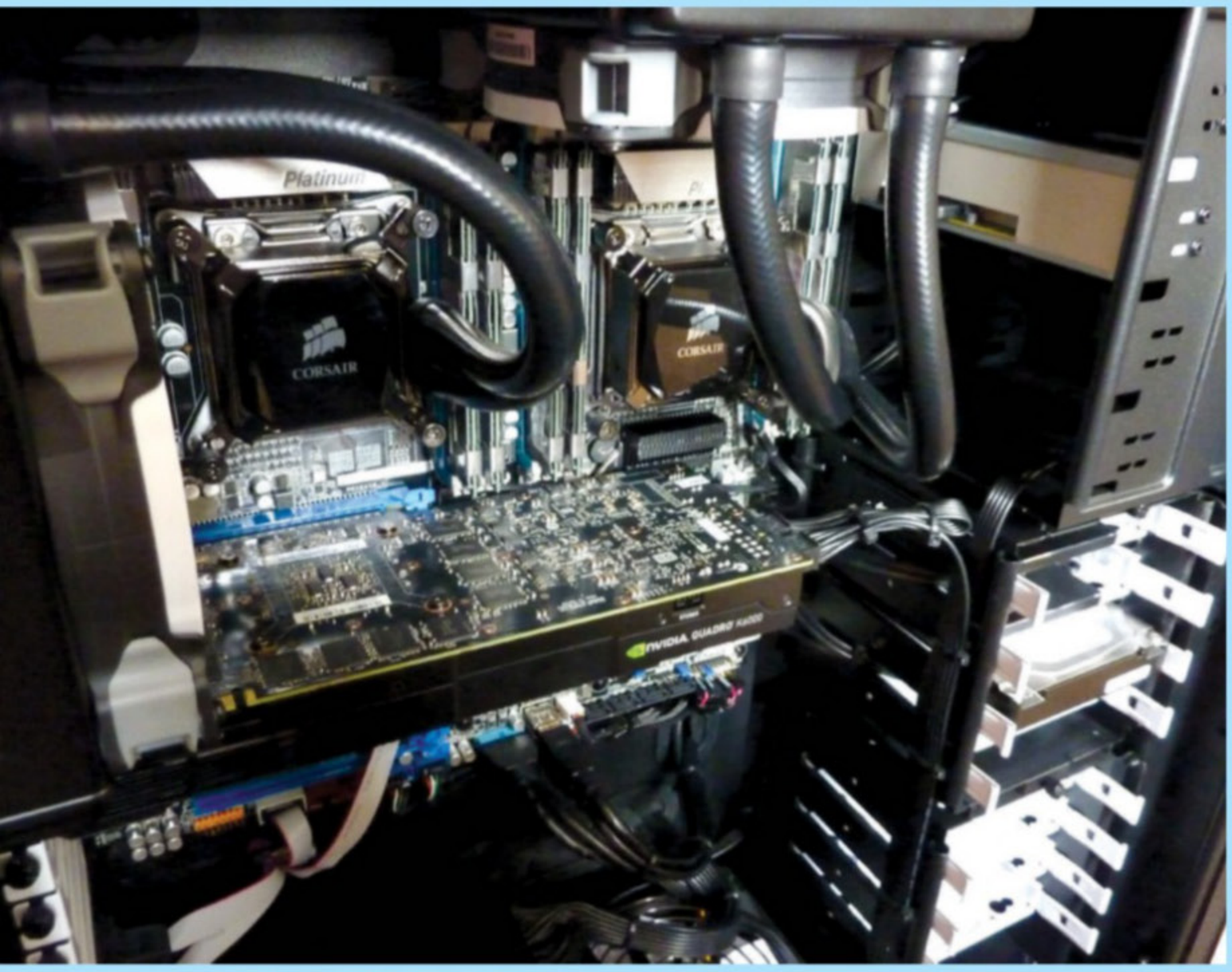
Scan has once again picked out the enormous Fractal Design XL for the 3XS GW-HTX35

We originally requested a K6000 graphics card alone, but as with AMD, Nvidia prefers its most high-end card to be shipped to reviewers in a workstation that reflects the environments where it will be put to work. It was Scan that was first to offer us a K6000-based workstation.

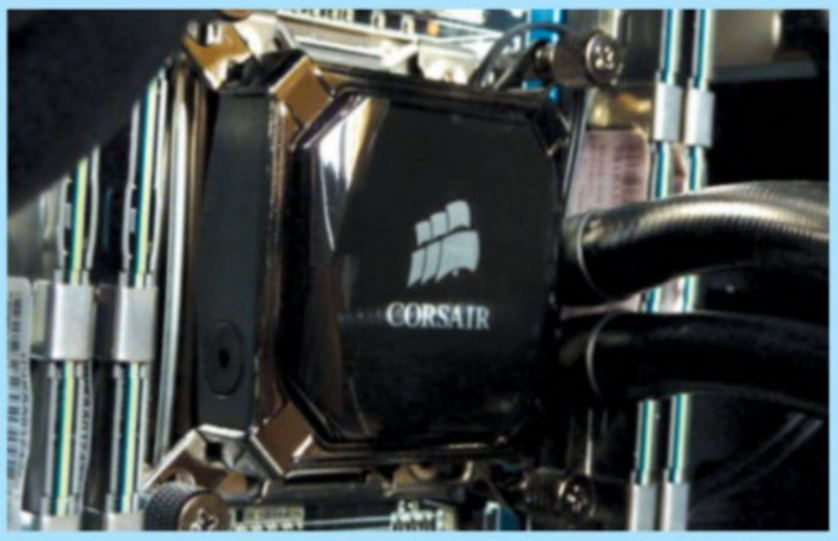
Scan has made some other small improvements to the GW-HTX35. While the processors are still cooled by custom Corsair sealed water-cooling systems – similar, but not identical to the H60 retail model – one of the radiators has been moved from the top to the rear of the case, presumably to spread the heat output more-evenly inside.

The storage has been upgraded too. Scan is now using dual 256GB Samsung 840 Pro SSDs as the main system drive, arranged in a RAID 1 array, along with a 2TB Seagate Barracuda hard disk for storage. Samsung drives are some of the best around, so it's good to see them included in the GW-HTX35. As it's RAID 1, you only get the total capacity of a single drive, but if one somehow fails, the other can be used to help rebuild your system drive with ease. Read speeds are approximately double what they would be with a single SSD.

As before, there are some extras too, such as a card reader with an illuminated Scan logo, and an optical drive. The overall workmanship of the GW-HTX35 is excellent – whip off the case panels and you'll see all the connecting cables neatly tucked out of the way on the rear of the case, with nothing obscuring access to the motherboard.



Aside from the water-cooling tubes, not a single cable obscures access to the guts of the 3XS



Dual Xeon processors are cooled by custom-made Corsair H80 liquid cooling systems

The Quadro K6000 alone is responsible for roughly half the cost of the GW-HTX35

It performs brilliantly too, with a massive improvement in some tests over the GW-HTX30. The 1080p Underwater demo in 3ds Max rendered 20 per cent faster, in just 5 minutes 49 seconds. SPECViewPerf 12 performance eclipsed the Armari Magnetar S16-AW1050, which has a heavily over-clocked Intel Core i7 processor and AMD Radeon W9100 graphics card. It's clear the K6000 is a fantastically powerful upgrade.

Its inclusion, coupled with the dual Xeon processors, really drives up the price of the GW-HTX35 to almost £10,000 including VAT. That puts it in an elite category of workstations, and it's just about the most high-end computer configuration that is sold by Scan Computers.

If you have a genuine need for the performance of the 3XS GW-HTX35, then it's likely your budget will stretch to it.

Essential info

Price: £9,136 (inc. VAT)
$12,745 US*

http://3xs.scan.co.uk/enterprise/professional-graphics-cad-workstations

OPERATING SYSTEMS

- Windows 7

TECHNICAL SPECIFICATIONS

- 2x eight-core 3.4GHz Intel Xeon E5-2687W
- 64GB 1,600MHz Hynix ECC DDR3 memory
- Nvidia Quadro K6000
- Dual 256GB Samsung 840 Pro SSDs
- 2TB Seagate Barracuda hard disk

The good & the bad

- ✓ Fast clock speed delivers excellent rendering times
- ✓ High-end Nvidia Quadro graphics card
- ✓ RAID 1SSD storage
- ✓ Well built, housed in a spacious case
- ✗ Top-end system requires a top-end budget

Our verdict

Features	9/10
Performance	10/10
Design	9/10
Value for money	8/10

"The 3XS GW-HTX35 is a high-end system that delivers superb all-round 3D performance"

Final Score 9/10

*Price conversion correct at time of printing

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Pulldownit 3

We take a look at whether the Pulldownit plug-in for Maya levels the destruction-simulation field

REVIEW BY Aldo Vicente, 3D artist in marketing and freelance

Pulldownit is a dynamic solver, fracture and rigid-body simulator developed by Thinkinetic, and the latest version of the plug-in has a new Preview mode for shattering, improved reshattering and a host of new functions.

The user interface is certainly a strong point for Pulldownit. Designed workflows and tool menus are well thought out, well organised, and really easy to understand. Experienced VFX artists will find Pulldownit's features familiar and probably more fun to work with than other systems. It's also a very welcoming system for less-experienced users. It has a simple layout that organises all the simulation tools into a very intuitive and easy-to-remember series of menus, as opposed to an overwhelming library of tools and attributes. This system really lends itself to providing quick and efficient results, with a friendly learning curve.

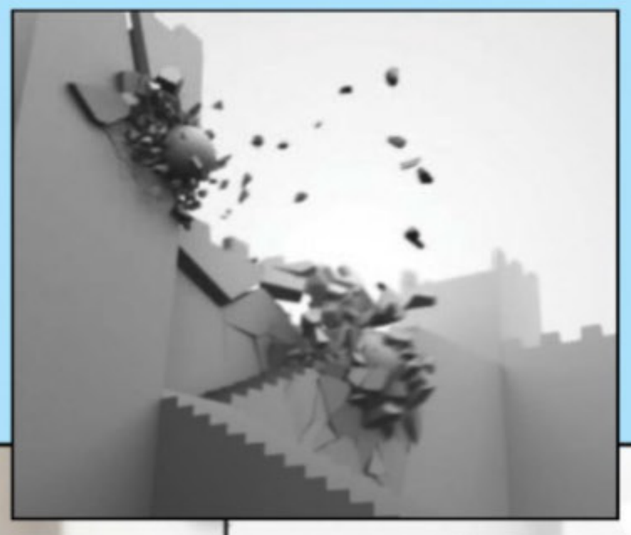
Fragmentation in Pulldownit is done before the simulation, rather than during collisions. This gives users more control over fragment patterns, but it could be said that collision-generated fragments would be more realistic. The Fragmentation system lets us choose from five Shatter Styles – Uniform, Local, Radial, Wood Splinters and Path Based. Overall, the set is robust enough to cover most conventional looks, but it would've been great to see more-specialised styles.

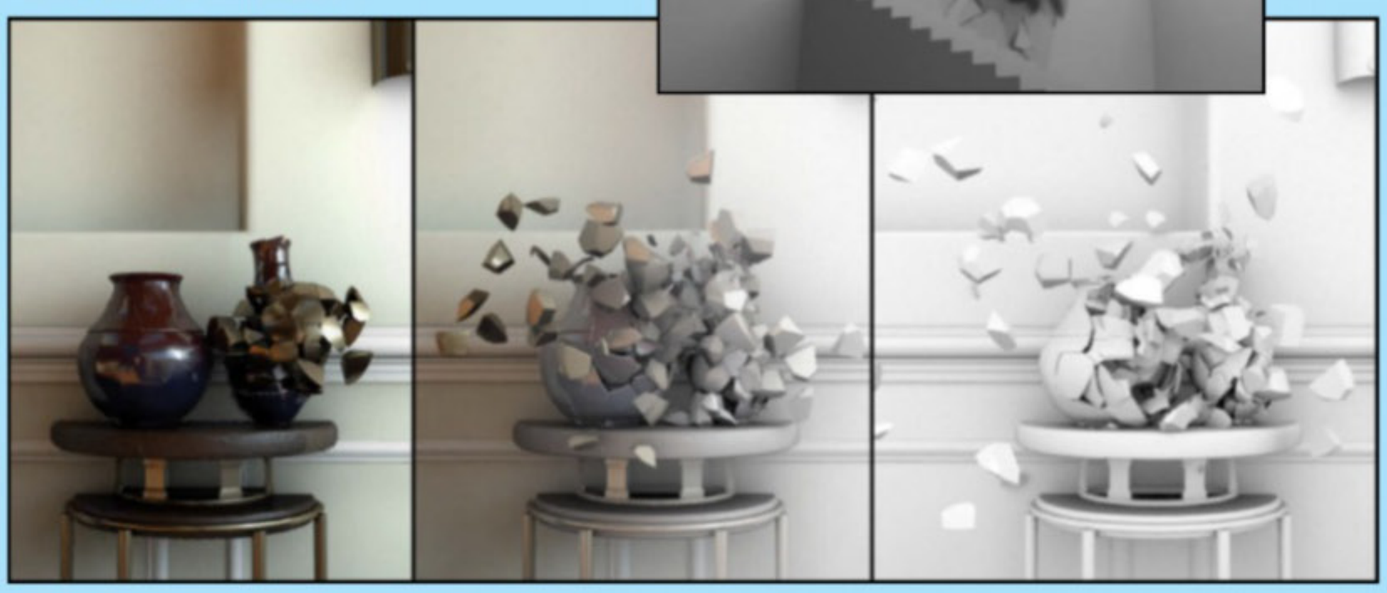
Pattern customisation is handled well. Each style has a set of adjustable features that range from Noise and Width to Interactively Positioned Epicentres and Cracking Paths. Preview mode is a newer feature that lets us visualise and adjust our Shatter parameters in the viewport. It's a very useful tool when it works, but I found it relatively unstable, sometimes deselecting or inexplicably hiding all geometry.

Even with thousands of pieces, fracturing geometry is blazing fast and calculations will rarely be over a minute. Torture testing with a 60k-poly object into 3,000 pieces clocked in at about ten minutes. The Shatter operation is consistent in generating clean fragment geometry, though errors show up sometimes.

Pulldownit boasts some solid all-around Dynamics. Calculations under all conventional circumstances are fast, accurate and easy to customise. The Fracture controls are versatile enough, but unfortunately can't be keyed. The Stresses system for controlling how fragments will hold together or break apart is simple and responsive. Solver controls are also very straightforward, and field integration is very well implemented.

Overall, Pulldownit is a very solid tool. There are more comprehensive, powerful systems out there, but Pulldownit is a capable and competitive option at almost any level of production. It sets itself apart with a great interface, efficient workflows and a deceptively deep level of control. Effective results and a short learning curve will make it an especially appealing option for generalists and users new to destruction VFX.





Fracture parameters, such as Clusters and Hardness, can be controlled for different areas to add shatter variety and unique simulations

Essential info

Price: approx. £315 / $525 US

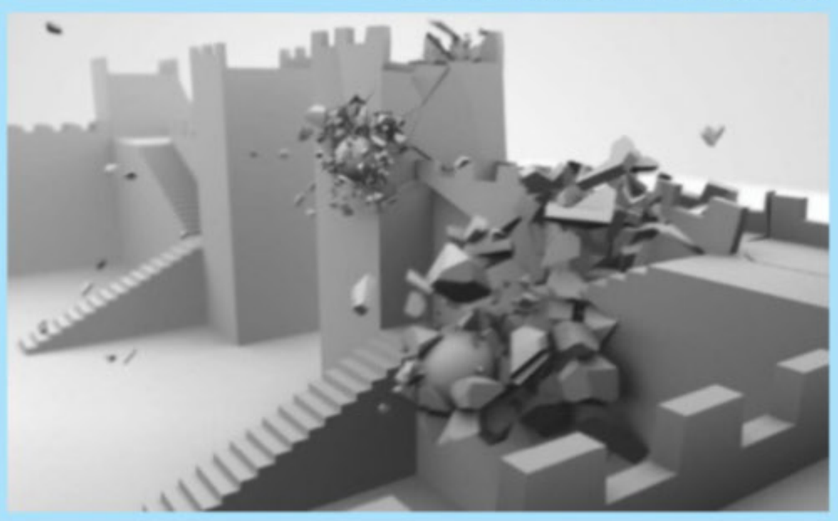
www.pulldownit.com

OPERATING SYSTEMS

- Windows XP, Vista, 7, 8
- Mac OS X 10.7 or later
- Linux

OPTIMAL SYSTEM REQUIREMENTS

- Autodesk Maya
- 64-bit Intel or AMD multi-core processor
- 4GB RAM



Fragmentation patterns can be seamlessly added onto one another on the same model, making it easy to customise and control fracture patterns

The good & the bad

- ✓ Easy to learn
- ✓ Excellent interface
- ✓ Highly customisable shatter patterns
- ✓ Very fast fragmenting
- ✓ Excellent Dynamics Solver
- ✗ Higher end of the price spectrum
- ✗ No collision-generated fragmentation
- ✗ Relatively short list of Shatter Styles
- ✗ Occasionally unstable features

Our verdict

Features	8/10
Ease of use	10/10
Quality of product	9/10
Value for money	7/10

"Pulldownit is powerful and user-friendly, but a bit more pricey than the competition. Overall, it's a great product"

Final Score 9/10

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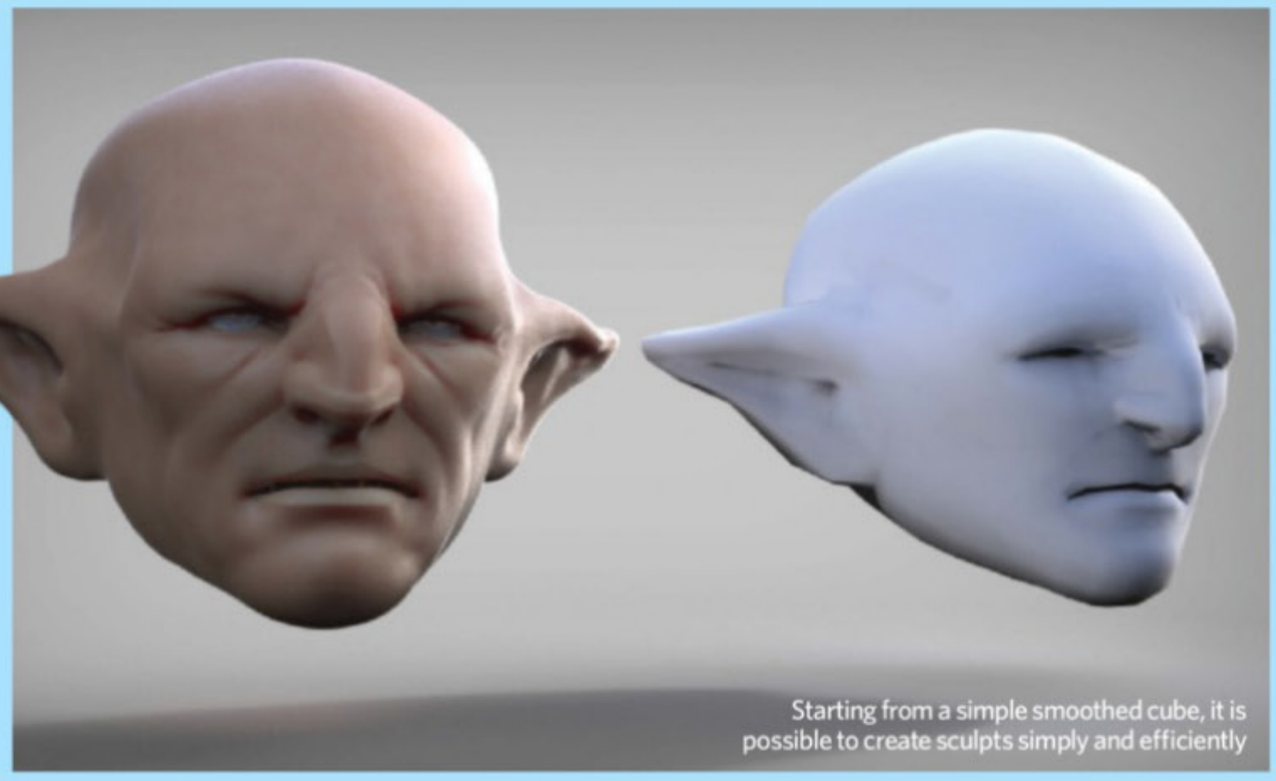


Starting from a simple smoothed cube, it is possible to create sculpts simply and efficiently

WaxLab 3D

As a new sculpting plug-in for Maya, WaxLab 3D looks like the latest rival to ZBrush and Mudbox, but can it compete?

REVIEW BY Adam Ball, lead artist, Evil Aliens, Australia

In the past, software like ZBrush and Mudbox have been the go-to tools for sculpting, but WaxLab 3D sets to rival them. On its main shelf there are three options to choose from. The Height Map option is used for generating terrain from Height maps, the WaxLab tab is where the sculpting happens and then there is GeoLink, which is a nifty feature that enables you to create a higher subdivision mesh that links to the lower subdivisions, ensuring they all keep the same silhouette.

When learning a new piece of sculpting software, my usual test is to create a goblin or an orc head, as it's a good way to have fun while learning, enabling you to push the limits of the character's proportions and visual style.

This specific goblin head was created from a smoothed cube, emulating a method that is commonly used in other standalone sculpting packages. The sculpting brushes available are limited compared with the competitor's options, as they only include a Standard brush, Bulge, Grab, Flatten, Pinch and Smear, all working exactly as you'd expect. However, if you're used to ZBrush's massive selection (which includes my favourite, the ClayBuildup brush) going back to Standard and Bulge simply doesn't cut it. There are ways to modify and save brush presets, but it would be nice to have some more available to start with. There is also the ability to mask and use stencils, which are essential while sculpting.

After getting a fairly good result, it was time to create a low-resolution version with an acceptable topology. This is where the advantage of being a plug-in for Maya starts to kick in. A low-resolution mesh was created using Quad Draw, then subdivided and shrink-wrapped to essentially project the details of the old model onto the new one. This is a technique used in ZBrush, and it was great to find the same function can be used in Maya. Once the sculpt was in the higher resolutions, Maya began to lag pretty badly while pushing verts around, although this is perhaps more to do with Maya than WaxLab.

Overall, WaxLab is good for the price. The brushes need work and Maya's performance at high resolutions leaves something to be desired, but this is a step in the right direction. If you're interested in sculpting within Maya I'd strongly advise giving the 30-day trial a shot and to make your decision from there.

If you have sculpted before you shouldn't have any problems learning this plug-in. Simply select your mesh, click the WaxLab button and away you go

Essential info

Price: $130 US (approx. £77)

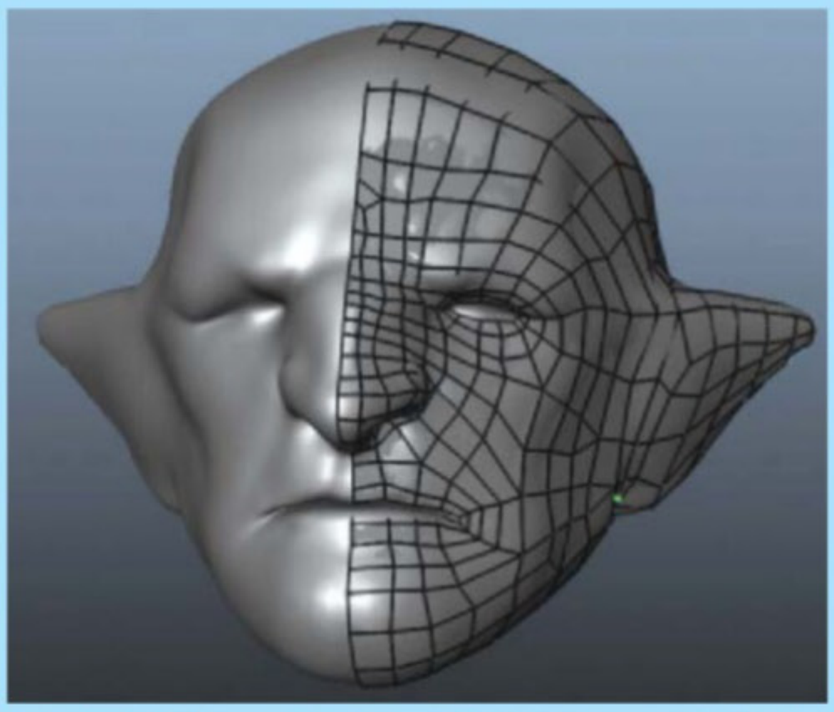
www.sigrasoft.com

OPERATING SYSTEMS

- Windows XP, 7, 8
- Mac OS X

OPTIMAL SYSTEM REQUIREMENTS

- Autodesk Maya 2013
- 4GB RAM
- 10MB hard drive space
- Hardware-accelerated OpenGL graphics card
- Intel Pentium 4, AMD Athlon processor with SSE support instruction set support (or higher)



It is a good idea to retopologise your model before you get into the higher subdivisions. Maya's Quad Draw tool is great for this

The good & the bad

- ✓ Good symmetry tools
- ✓ Masking and stencils
- ✓ Has the basic brushes you would expect
- ✓ Easy to use
- ✓ GeoLink works well
- ✗ Could use more tools
- ✗ Poor performance at higher resolutions

Our verdict

Features	5/10
Ease of use	8/10
Quality of product	7/10
Value for money	7/10

"WaxLab 3D is good for the price, but do not expect ZBrush- or Mudbox-like results"

Final Score 7/10

Technique focus

Incredible 3D artists take us behind their artwork

TEXTURING To express colour and shadow, I mainly used Diffuse, Specular and Bump maps. Some pure colour elements, such as the fortune cat and all three cats' faces, were all painted directly in ZBrush. I wanted the image to be vibrant, so I chose some high-saturation pictures as Diffuse textures. I added an AO map on top, to make it all sharper. **Moments on Cat Planet,** 2014

Jingjing Liu

Website www.cristata.cgsociety.org
Country China
Software used 3ds Max, ZBrush, Photoshop, V-Ray
Bio I work as a college teacher and after work I study CG, depicting my favourite animated characters

workspace 3D

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“The first very short teaser for the *Batman vs. Superman: Dawn of Justice* movie was shown, along with a concept-art image”

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A first look at Batman vs. Superman from Comic-Con
Warner Bros.
Warner Bros revealed previews at Comic-Con San Diego, with a teaser for *Batman vs. Superman: Dawn of Justice*

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Comic-Con's VFX

The future of feature-film visual effects looks bright at the 2014 San Diego Comic-Con

A multitude of exciting announcements and previews were made at the largest Comic-Con in the US this year, hinting at the future for feature-film VFX.

It's a future that is full of very CG-heavy superhero movies, according to Marvel's announcements. The cast and crew of both the upcoming *The Avengers: Age of Ultron* and *Ant-Man* movies were present at the studio's panel, discussing the films with the help of new footage and concept artwork. Before the film even came out in the cinema, it was announced that *Guardians Of The Galaxy* would be getting a sequel in 2017.

Meanwhile, Warner Bros revealed some highly anticipated new previews to its own upcoming superhero films. The first short teaser for the *Batman vs. Superman: Dawn Of Justice* movie was shown, along with a concept-art image that featured a darker, grittier-looking Gal Gadot as Wonder Woman for the first time. The studio also revealed a new trailer for the final instalment of Peter Jackson's *The Hobbit: The Battle Of The Five Armies* in an extended panel, which brought a major group of the film's actors to the stage. There was footage from George Miller's *Mad Max: Fury Road* reboot that got fans excited with a post-apocalyptic landscape and action-packed chase sequences. According to interviews with Miller himself, as many practical effects as possible are being used throughout the filming to avoid the lack of immersion that seeing 'too much CG' can give him with other films.

Other surprises from the show included a *King Kong Origins* movie announced for 2016, as well as the fact that Gareth Edwards is now officially going to be directing a *Godzilla* sequel. There was also a presentation from Naughty Dog creative director Neil Druckmann on the film adaptation of PlayStation game *The Last Of Us*, while Matthew McConaughey and Christopher Nolan gave a glimpse of *Interstellar* during the Paramount Studios presentation.

Comic-Con International: San Diego

The San Diego Comic-Con was first started in 1970 as a one-day minicon organised by a group of comics, movie and science-fiction fans, including Shel Dorf, Ken Krueger and Richard Alf. Today attendance to the yearly event regularly tops 130,000, with fans coming for panels, animé and film screenings, costume competitions, as well as the autograph area inside.

The first images released for the upcoming *Batman v Superman* film from Warner Bros. For more details on the San Diego Comic-Con, visit **www.comic-con.org**
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● **HAVE YOU HEARD?** ▪ Pixar has announced a Christmas special, *Toy Story That Time Forgot*, to air 2 December

The UK's favourite genre

Animation triumphs over any other form

According to figures from the British Film Institute's Statistical Yearbook from 2014, animation seems to have replaced action as the UK's favourite film genre for the first time. The highest-earning film at the box office was *Despicable Me 2*, while features such as *Frozen*, *Monsters University* and *The Croods* were all in the top ten films at the UK box office last year, representing more than 20 per cent of the total UK box office with £247 million generated.

With the fact that young people aged seven all the way up to 24 make up 47 per cent of total admissions at the cinema, this is good news for the future of animation, which certainly seems to have continued to expand its audience so that it's no longer seen as just for kids. Overall, this marks the third year in succession that the UK film box office revenues have successfully £1 billion in total revenues.

With exciting animations having been released, such as *Monsters University* and *Despicable Me 2*, it's no surprise that animation is the UK's favourite genre

Lawsuit for VFX studio

Florida has filed a lawsuit against Digital Domain

The state of Florida has filed a lawsuit against Digital Domain, stating that the former executives of the VFX company cheated taxpayers out of more than $80 million.

Accusations against former Digital Domain CEO John Textor and the chief financial officer Jonathan F. Teaford. "For some time, Digital Domain California had been seriously indebted, including to Falcon Mezzanine Partners, its principal lender," states the lawsuit. "Falcon came to hold various notes, stocks, and warrants that by 2009 enabled it to take over the company in the event of a default and call in millions of dollars of personal guarantees.

"Before 2009 Digital Domain California hatched a new plan to rid itself of debt: 1) Start a brand new company with no debt; 2) Use Digital Domain California's credentials, together with promises of new high-paying jobs for Floridians, as security to obtain grant money; 3) Use the grant to partially bail out Digital Domain California; then 4) Merge Digital Domain California with Digital Doman Florida to keep the failed business model going."

DreamWorks CEO rewarded

President Obama honours Jeffrey Katzenberg

Obama visited the DreamWorks California studio in November last year, where artists staged a protest against the outsourcing of jobs

In an event at the White House, President Barack Obama awarded CEO of DreamWorks Jeffry Katzenberg with the 2013 National Medal of Arts, the nation's highest award given to artists and their patrons.

Katzenberg was one of Obama's top campaign donors, personally donating $3.15 million to Democratic super-PACs throughout the 2012 election cycles. He reportedly helped to raise almost $30 million from other Hollywood figures.

The Medal of Arts was also awarded to 11 other individuals and companies this year, including singer Linda Ronstandt and filmmaker Albert Maysles, who won the prestigious award for his innovations in camera work within cinéma vérité.

Software shorts

Bringing you the lowdown on product updates and launches

Houdini Engine for Maya

Side Effects Software has announced the immediate release of Houdini Engine for Maya. The plug-in provides both animation and game studios with a much deeper integration of Houdini's procedural technology into Maya, perfect for anyone working in a mixed pipeline. Artists with Houdini or Houdini FX licences can run the Houdini Engine using their existing licences. For more information, visit the website at www.sidefx.com/maya.

Affinity Designer

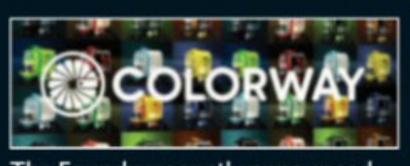
Built exclusively for Mac, Serif's Affinity is the new name for its next generation of design apps for professionals, including the new Affinity Designer. The vector illustrator looks set to be a rival to Adobe Illustrator, and is at a lower price point, combining layer management with a range of high-quality raster tools for imaging. See more and get the Beta for free at www.affinity.serif.com.

Fabric Engine 2.0

Fabric Software has announced that visual programming, coming in Fabric Engine 2.0 released later this year, will enable TDs to learn and use Fabric Engine even more easily. Code is represented in nodes that can be manipulated in a visually interactive way. Download the standalone application framework at www.fabricengine.com/get-fabric.

The Foundry's app

The app was made to let artists develop the final lighting and colours of an image



The Foundry recently announced plans to launch another product, code-named Time, later this year

The Foundry revealed new software with COLORWAY, which provides a simple environment where 3D artists can develop the look of objects. Users can iterate quickly with clients, who are able to pick the images they prefer and make real-time changes with the COLORWAY Presenter.

"I've had a few chats with people who think that it could save them time during the look-dev process," explains Matt Brealey, COLORWAY product manager. "The idea that you could render an initial version of a character/scene to COLORWAY and then look-dev the colour palette in real-time before finally passing those approved colours back to 3D is really very interesting."

DID YOU KNOW? • LAIKA CEO Travis Knight says that he hopes to make a hand-drawn animated film in the future

Project Focus

Dawn Of The Planet Of The Apes

Pre-vis master Duane Floch talks about MPC's work on the latest instalment of the Apes franchise

MPC

Project *Dawn Of The Planet Of The Apes* pre-vis

Studio MPC

Description *Dawn Of The Planet Of The Apes* is set ten years after *Rise*, and sees Caesar lording over a growing ape civilisation in the woods after most humans have fallen to a simian flu pandemic

About MPC Last year MPC opened a pre-production studio in Santa Monica, California. Executive producer Julian Levi and pre-vis supervisor Duane Floch have joined forces to offer a broad scope of pre-production services, including pre-visualisation and visual development, to the film industry. The new facility features an MPAA-approved pre-vis artist workspace and screening room

Country USA

Website www.moving-picture.com

Contributors

Duane Floch
MPC pre-visualisation supervisor

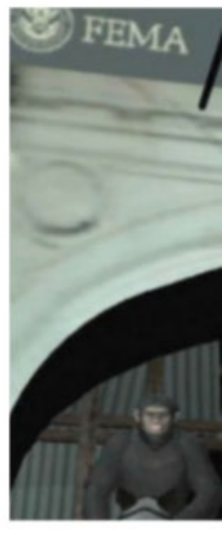
MPC's Duane Floch reprised his role as overall pre-vis supervisor (which he held on *Rise*) for *Dawn Of The Planet Of The Apes*. This time around, having been through the process before, the studio was more comfortable being selective about which sequences really needed pre-vis to help inform production in the shoot. "A lot of sequences were boarded before the actual sets were either designed or put into place. One of the roles of pre-vis is to inform production what will work, and what won't, in equal measure. We did pre-vis on something in the neighbourhood of 850 shots. It was a little different than *Rise*, where the edict from the studio was to pre-vis every shot that had an ape in it to ensure that what had been boarded was going to work," Floch explains.

Two teams were assembled for pre-vis in the autumn of 2012 – the New Orleans team had 18 artists and worked with production, while the other in Santa Monica had 12 artists. However, the sequence where the humans are approaching the dam was shot in British Columbia. "Rather than make some generic thing, we pulled the topographic data out of Google Earth and we were able to re-create contours of the land and place cameras exactly where the crew [would] actually be able to place cameras," Floch explains. "Google Earth is great – you get geo co-ordinates from production, and there we go."

Ape models were received through Cinedev, Fox's in-house pre-vis department, which was the first to begin by doing some pitch-vis on the film and some work on the Elk hunt sequence. "[Cinedev] got its ape geometry from Weta, so the characters looked a lot like the final characters, more so than on *Rise* where we had rather generic characters, and with those rigs we inherited a little bit of mocap," Floch explains. Maya was used for 3D pre-vis, but assets provided by the art department were often modelled in Rhino and required conversion from NURBS to polys and then cleaning up. ZBrush sculpts were also provided, but needed polycount reduction to become more manageable for pre-vis.

> "One of the roles of pre-vis is to inform production what will work, and what won't"
> **Duane Floch, MPC pre-visualisation supervisor**

After Effects was used for finishing dailies. "We used depth of field quite a bit, and to get that we weren't using Maya's Viewport 2.0, we were faking it by rendering out in layers, comping and blurring the deep background, slight blur on mid-background, and no blur on foreground, and there were rack focuses as required." Floch expects to harness Viewport 2.0 for future pre-vis work. "I think Viewport 2.0 is really coming into its own with 2015. Our plan is to move in that direction and include shadows, depth of field and Ambient Occlusion in-camera. Those kind of visual niceties are a little more pleasing than what you usually get with a standard Playblast, which I'm looking forward to. In the next year or so, we also plan to move into a NUKE-finishing pipeline as artists in LA are becoming more familiar with the software."



A There's usually an idea of which shots won't work the way they're boarded. After a pre-vis first pass, ways to reconceive the shot are discussed so it works in the existing physical set

B Managing to maintain the same sort of look and sharing the assets between both of the teams was important, regardless of which team was working on a particular asset

C Director Matt Reeves set a clear aesthetic throughout the whole film, which began in pre-vis. Any POV shot was grounded in some geographical location so there was no confusion

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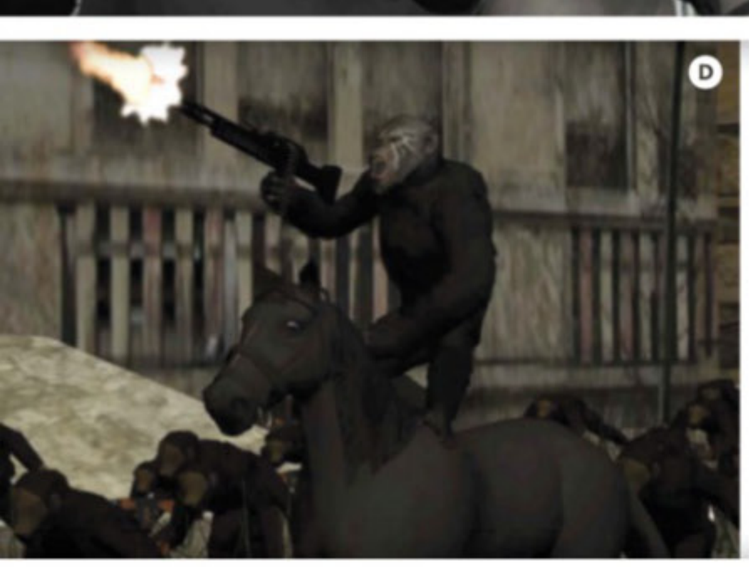
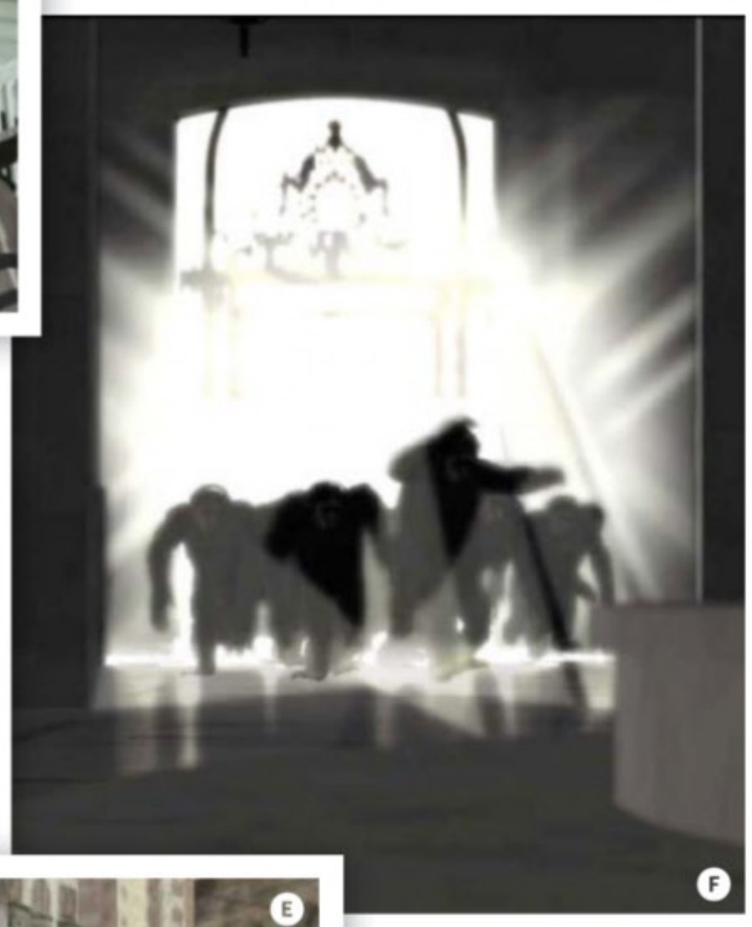




Pre-visualising the colony attack sequence

Of the pre-vis sequences MPC worked on, the most challenging was the colony attack where hundreds of apes invade the human colony in San Francisco en-masse

"We did a pre-vis first pass of the colony attack sequence as it was boarded," explains Floch. "Director Matt Reeves had a look and decided it felt a like a western shoot-em-up so Brad Parker (second unit director) was put in charge." Parker chose to juxtapose three unique perspectives, that of Koba, Ash and Dreyfus, so the audience would always know whose eyes they are witnessing the attack from. "Working with over 500 apes, trying to keep the story straight and stay efficient with what we are outputting, it was important to distil it down to what it needed to be."

All film stills Courtesy of Twentieth Century Fox

D Muzzle flashes are Cards on the geometry. Each one had a switch so that you could have a sporadic fire, or constant fire keyed on or off, depending on what was required

E The deep background characters have no rig. Animation from the cycles were transferred onto the geometry so it was easier to fill up massive battle shots with lots of apes

F Depth of field, fog and plenty of Cards for light streaming were all utilised with the goal of building in as much atmosphere and fake realism into environments as humanly possible

G Occasionally Shadow Cards were used on characters and along the edges of some buildings to mimic an ambient occlusion effect, but for the night shots it was much less of a worry

Studio Access

Scanline VFX

We talk to the team responsible for some of Hollywood's most-notorious VFX scenes

SCANLINE VFX

Scanline VFX is an award-winning, full-service studio that specialises in high-end feature film and commercials. Celebrating 25 years in effects, Scanline has facilities in Los Angeles, Vancouver, Munich and Cologne. The company's Vancouver branch is in the process of moving into a new studio offering over 35,000 square feet, with a capacity for 450 employees

www.scanlinevfx.com

Country USA

Project *Captain America: The Winter Soldier*

Client Marvel Studios

Software Maya, 3ds Max, NUKE, Flowline

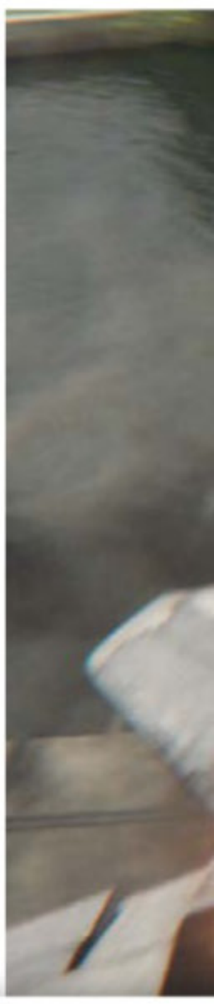
With several successful Marvel projects under its belt, including *The Avengers* and *Iron Man 3*, Scanline VFX has proved itself time and time again as the go-to visual effects studio for bringing comic-book superheroes to life.

One of the award-winning studio's latest triumphs was the immensely popular *Captain America* sequel, *The Winter Solider*, where the team was charged with delivering a whopping 18 per cent of the final movie – 450 out of the film's 2,500 shots. "We did a pretty cool, challenging sequence, where the Quinjet chases Steve Rogers as he flees on his motorcycle, as well as an elevator fight with extensive CG environment work, some fight enhancements, and some digital Steve Rogers shots. The opening sky dive and Lemurian Star hostage rescue was us, too, as well as a lot of what you might call invisible supporting visual effects," reveals VFX supervisor Bryan Grill, as we ask him about the studio's work on the film. What's more impressive is that Grill and his team effectively rolled from one hit Marvel movie on to the next, as they started work on *Captain America: The Winter Solider* on 1 April 2013, just five days after delivering the final shots on *Iron Man 3*.

As well as creating stunning digital effects at the office, the studio also supported the Marvel visual effects team on set both in Los Angeles and Cleveland, which involved taking set photography, creating textures and set-data wrangling. One of the biggest and most-impressive VFX scenes of the movie was the notorious elevator fight sequence. "It was the first sequence shot for the movie," Grill explains. "They had an elevator on a greenscreen stage with two large light boxes with a moving light source through it to give us the feeling of light and shadow, helping with believability of the static elevator moving down. The first few days were shot inside of the elevator with the first layer of glass in. The rest of the shoot was filmed without it. So throughout the sequence, we were either taking out unwanted reflections or completely adding new reflections using the plate, our CG elevator and witness camera material.

"Lots of roto and colour correction was needed to make the elevator feel like it was on the corner of the building overlooking the Triskellion and the rest of the D.C. environment," Grill continues. "The CG elevator was rendered out into elements, which were then brought into NUKE so the compositors had all the freedom they needed to create new glass, cracked glass, reflections, shadows and the outside steel cage of the elevator. For our first delivery we had to produce 90 elevator shots in three weeks for the *Captain America 2* sneak peek at Comic-Con. We had to put in the DC environment and do as much

A



Contributor

Bryan Grill
VFX supervisor

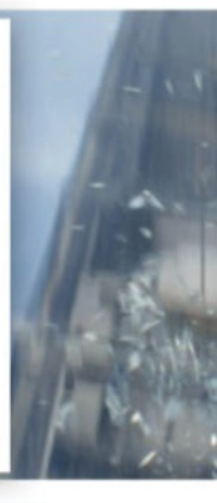
> "I'm quite happy with how we ultimately nailed all the lighting, reflections and textural subtleties"
>
> **Bryan Grill, VFX supervisor, Scanline VFX**

Portfolio highlights

Here are some of the big movie projects Scanline VFX has worked on:

2014 *Into the Storm*
2014 *300: Rise of an Empire*
2014 *Godzilla*
2014 *Divergent*
2014 *Game Of Thrones (series 4)*
2013 *Iron Man 3*
2013 *Man of Steel*
2013 *White House Down*
2013 *A Good Day To Die Hard*

B



All images © Scanline VFX | *300: Rise of an Empire* images © 2014 Warner Bros. Pictures

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C

E

reflection clean-up as possible. Even though there was still a lot of detail work that needed to be done to complete the final look, we were very happy about the work that we had done in such a short amount of time. Marvel eventually used that fight sequence in a trailer ahead of *Thor: The Dark World*."

Scanline VFX Los Angeles and Vancouver studios, supported by the German branches, took just ten-and-a-half months to complete the project, "I'm quite happy with how we ultimately nailed all the lighting, reflections and textural subtleties that made that elevator and the surrounding environment feel totally real," Grill beams. Without a doubt, the industry appeared to agree as the work received a BAFTA nomination.

D

A "For the Quinjet sequence we were tasked to do a full CG environment of Washington D.C. including the Potomac River and Theodore Roosevelt Bridge," explains Grill

B Recent blockbuster projects for the team include: *Pompeii, The Wolf Of Wall Street, Black Sky, Percy Jackson, The Avengers, Battleship, Hereafter, Narnia: Prince Caspian, Poseidon* and *300: Rise of an Empire*

C "This sequence happens on the bridge where Captain escapes the Triskelion and dismantles a Quinjet. For the close-ups of Captain on the motorcycle, the plates were shot on a bridge in Ohio"

D "This sequence required close-up 3D renders of the elevator, the Triskellion and the atrium. Simulations of Captain falling through both the glass elevator and atrium glass roof were important"

E "For the establishing shots, we had to model a full-CG photoreal version of this concept," Grill explains as he reveals the Lemurian Star was based on two sea vessels: The Sea Launch and the Ocean Odyssey

Industry insider

Martin McBain

Cinematics director / animator

This self-taught veteran animator tells 3D Artist how starting a career in videogames can open the door to Hollywood

About the insider

Job title Cinematics director / animator
Location Midlands, UK
Company website www.martinmcbain.com
Education Self-taught
Biography McBain's first few design jobs led to a role in animation, followed by a post as a senior animator at Eurocom. Since leaving the company in 2012, he has worked on numerous videogames and movie projects, even enjoying stints at Pinewood and Warner Bros. Studios. He is currently back in games, enjoying a new post at a studio in the Midlands

As a small child, born and raised in a small town in Scotland, Martin McBain never dreamt he'd one day be working in the entertainment industry, deciding instead to become an architect. "I soon realised that the job didn't involve creating the amazing visuals I'd dreamed of," McBain reveals reflecting back on how it all began for him. "I came across an advert for 3D Studio and just seeing the rendering and stunning visuals had such a major impact on me that it changed my entire career path in that one moment."

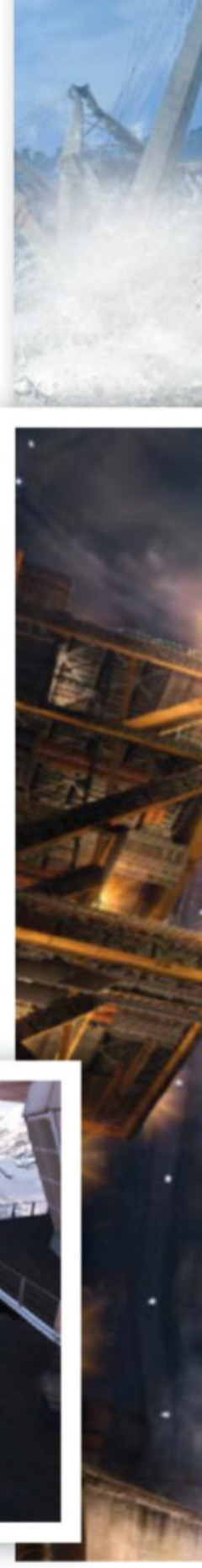
After grafting for several years in game development, McBain's name was starting to get known by the industry's movers and shakers, which resulted in an opportunity to work on a series of blockbuster films. "Having worked on numerous movie-licensed games, and being a huge film buff, I jumped at the chance. Fortunately, because I spent a large percentage of my career devoted to cinematics, I had built up the necessary cinematography skills to make a smooth transfer from games to film. Pre-visualising scene and shot layout has been thrilling. I've been working on some really exciting experimental techniques to film certain shots and I can't wait to see how it's all going to look on the silver screen!"

What has been the highlight moment of your career?
I've had a lot of fun throughout my career, so it's hard to pick just one, but if I had to, then it's got to be working with Ben Cooke (Daniel Craig's stunt double). We shot intricately choreographed stunt and fight scenes for the reimagined *GoldenEye 007* that really captured the essence of James Bond. It was amazing to direct a professional stuntman as it really opened up a wide range of possibilities to produce some really ambitious and powerful scenes.

Where do you seek inspiration from?
Being an avid gamer and a massive fan of first-person shooter (FPS) games, I thoroughly enjoy the epic scale of *Call Of Duty*, as well games like *The Last Of Us* and the *Metal Gear* series, which have absorbing stories and emotionally engaging characters. I also love movies and can happily spend hours rewatching and analysing scenes, looking at shots. Having recently discovered Nordic authors, such as Jo Nesbo and Henning Mannkell, I find the intensely brooding atmosphere and unique style of their novels hugely inspiring. Observing the characters and how they hold up a mirror to the complexities of real life and human frailty, it's something I love to capture in my work – depending on whether it's appropriate for the project, of course!

How is the industry changing?
There's been a shift towards would-be developers taking industry-specific courses and degrees. When I started out, there were no relevant courses, so recruitment was based upon different attributes. Now qualifications are a pre-requisite. While many courses are fantastic, there are complaints that not all prepare students for the reality of getting a job in the industry. As it's a new field of study, this may well improve over time, but as this is a notoriously difficult profession to get into, I do worry about swathes of new graduates with very narrowly focused degrees competing for a small number of positions.

As a would-be developer, what would you have done differently?
Play more videogames! While growing up, my dad would tell me to stop wasting my time playing games... Who knew I was doing valuable research for my future career? However, he also instilled great values such as working hard. I'd say that if you really want something then you need to be focused and determined, but it is truly worth pursuing your dreams.



portfolio highlights

Some recent projects that Martin McBain has worked on:

2014 Major films at Pinewood and Warner Bros.
2014 *Kinect Sports Rivals*
2010-2011 *GoldenEye 007 / GoldenEye 007: Reloaded*
2010 *Vancouver*
2009 *Dead Space: Extraction*
2009 Disney's *G-Force*
2008 Beijing Olympics
2008 *Quantum of Solace*

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The right software

Martin McBain explains what software and disciplines are needed to do his job

"I mainly use 3D applications such as Autodesk Maya, 3ds Max or Motion Builder. Working in games requires a thorough understanding of the game engine and tools that your studio uses. These can either be brought in or done in-house. Final editing and composition involves apps like Adobe After Effects and Premiere."

> "I'd say that if you really want something then you need to be focused and determined"

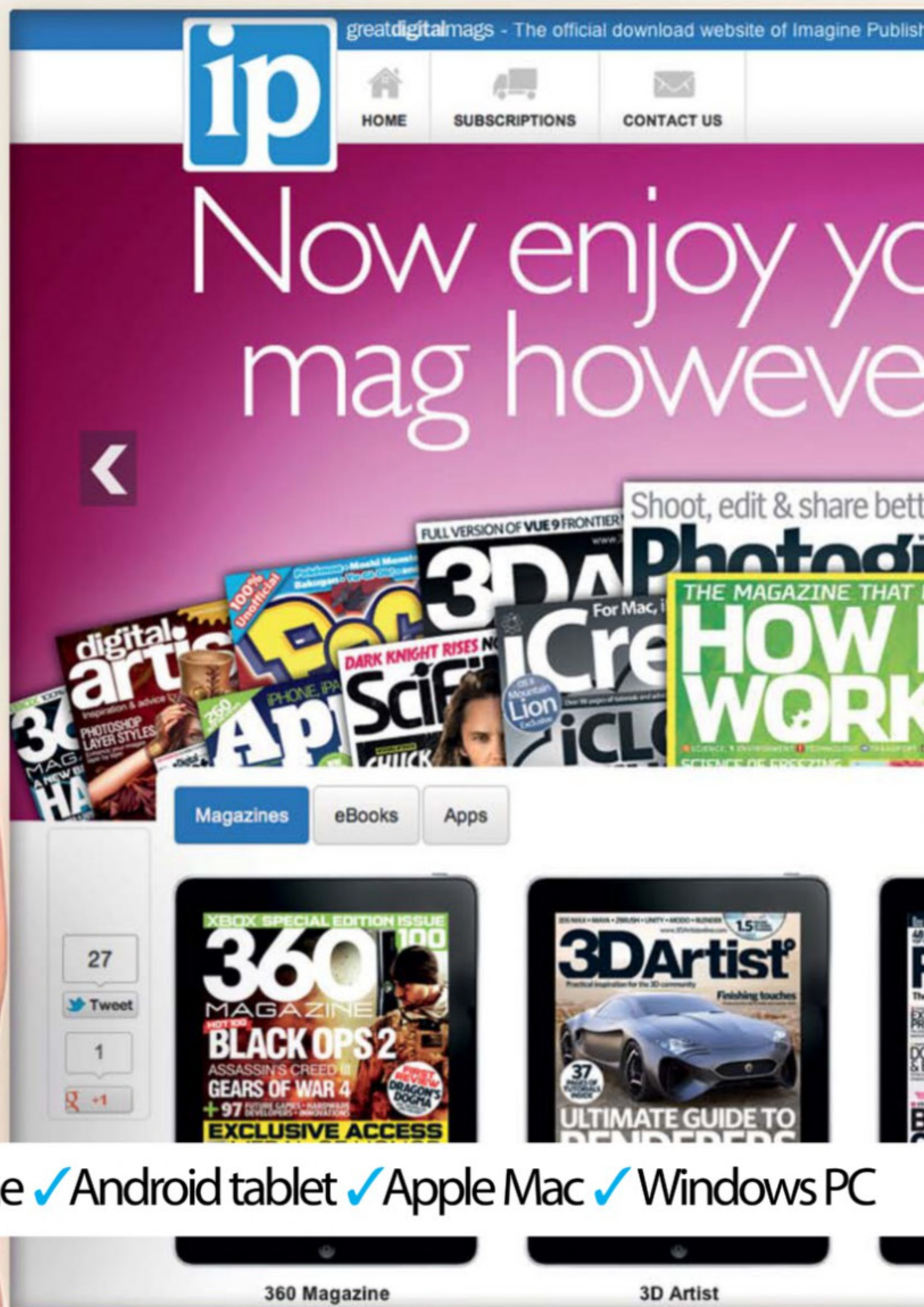
A "When directing game cinematics, there is an incredible amount of planning that's involved – especially if considering motion capture," explains McBain

B "Careful preparation pays dividends, as it makes a massive difference to the quality of the work that is produced. Nevertheless, I always like to leave a bit of room for spontaneity"

C "I love seeing other artists grow in ability and confidence. I see myself concentrating on mentoring more as I love to help out those who are newer to the industry"

D "When creating scenes like this I always ask myself 'does the sequence hold the viewer's attention? Does it inform the player and drive the narrative forward?'"

E "Patience, a good sense of humour and a strong understanding of human motion and behaviour are handy in this profession," enthuses McBain



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